MODERN
Machine Shop
January, 1939

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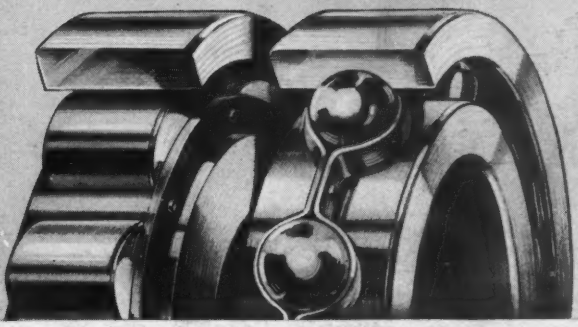

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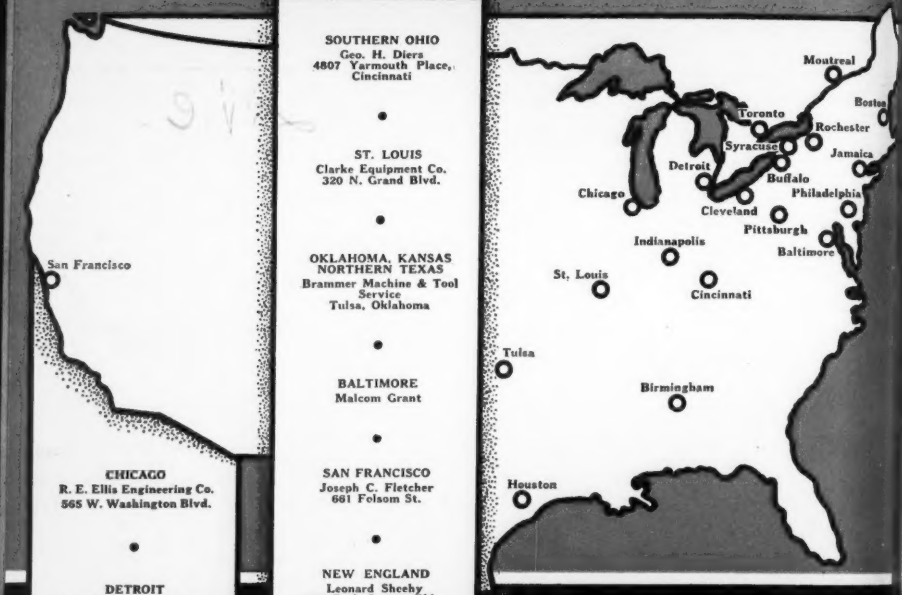

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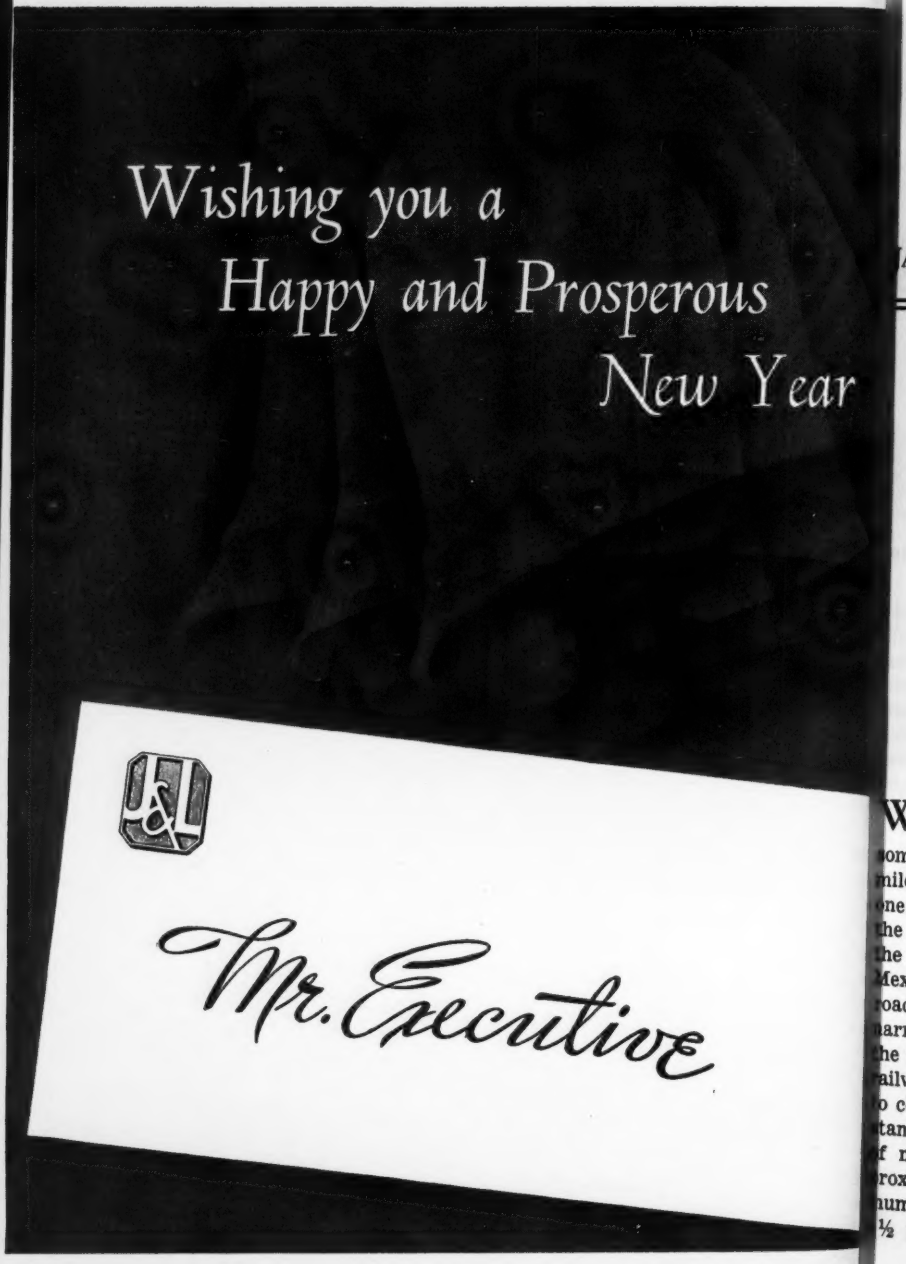
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MODERN
Machine Shop

CINCINNATI, OHIO

JANUARY, 1939 VOL. 11, No. 8

Mexican National Railway Shops Are Well Equipped

Modern Tools and Methods Employed in Shops of Mexican National Railway at Mexico City

By HOWARD CAMPBELL
Editor, Modern Machine Shop

WHEN it is considered that a train has to climb from sea level to something over 7,400 feet in the 264 miles from Vera Cruz to Mexico City, one can readily understand some of the problems that have to be met in the maintenance of locomotives in Mexican railway shops. The first railroad in Mexico was built in 1880, a narrow gauge road extending over the route just named. In 50 years the railways in Mexico have been extended to cover approximately 7,000 miles of standard gauge road and 1,550 miles of narrow gauge, or a total of approximately 8,550 miles. The maximum grades on the narrow gauge are 4½ per cent, with 3½ per cent the maximum on the standard gauge roads.

The Mexican National Railway System owns some 1,500 locomotives, of which 750 locomotives are in active service throughout the entire system. The lines are served by three shops; the Mexico City shop, which is 50 years old, the Agua Caliente shop, 37 years old, and the Monterrey shop which is only 7 years old. The Mexico City shop will be discussed in this article.

The shop under discussion serves about 150 locomotives in active service. Production per month is around nine engines on general and heavy repairs, which according to the Mexican

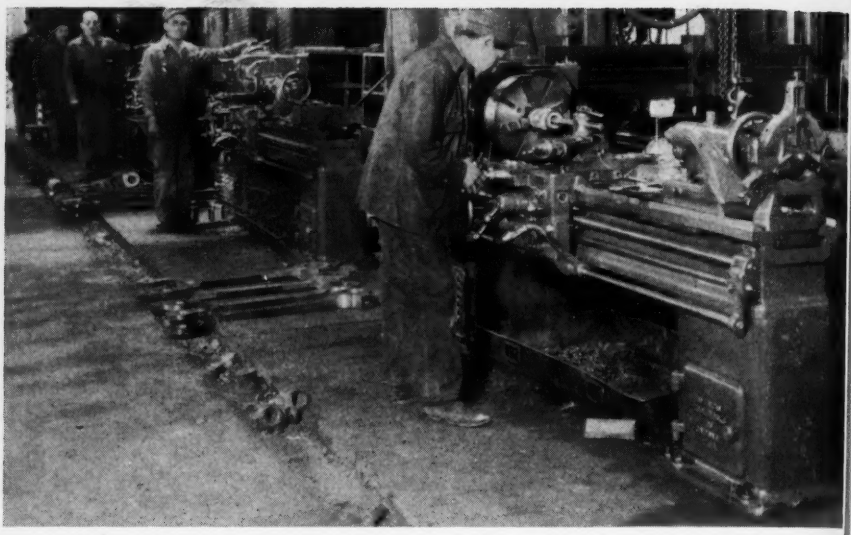


Fig. 1—These six "American" motor driven geared head manufacturing lathes provide for speed and accuracy in the machining of small parts.

code includes new fire boxes. This shop also repairs some 70 cars per month on general repairs, these including both standard and narrow gauge. The Mexico City shops employ approximately 2,000 men with a pay roll of approximately $250,000 per month.

It is interesting to note that the majority of the tools in use in the Mexican shops are of American manufacture, and it can be said that the workmanship of the Mexican mechanics compares in every way with the quality of the work turned out in American shops. The buildings in general are of lighter construction, due to the warmer climate prevailing in Mexico, but the equipment layout is substantially the same as that which would be found in any American shop.

For instance, note the line of "American" lathes shown in Fig. 1. These lathes are individually motor driven and all are equipped with the "American" patented 100 per cent anti-friction geared heads with automatic pump circulating oiling systems. Because of their versatility, high spindle speeds, rugged construction, and ease of handling, "American" lathes are favorites in the Mexican National Railway shops. A line of "American" shapers is also to be found in the Mexico City shops, and Oster-Williams threading machines are used for threading bolts and studs.

The illustration Fig. 2 shows a Niles wheel lathe at work. The machine is of modern design with centralized control, special air hoist for swinging the wheels into and out of the lathe, power traverse and clamp for right hand headstock, calipering attachment, automatic lubrication, and so on. Two turret tool holders are employed, each holding four tools which can easily be removed for grinding and reset in the original positions. Using high speed steel form tools, a pair of wheels is turned in

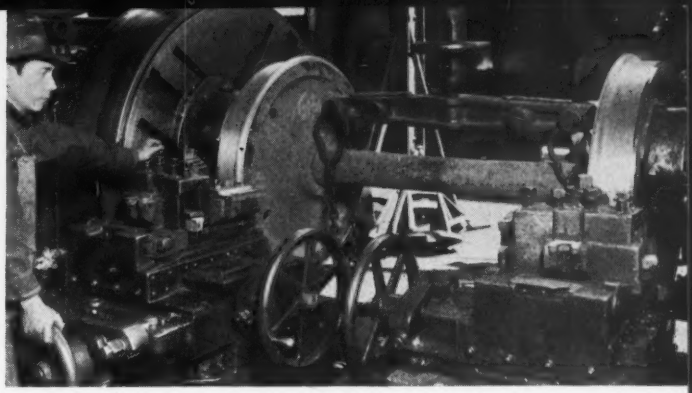


Fig. 2 — A pair of wheels are turned complete in 45 minutes on this Niles wheel lathe. The lathe is equipped with two turret holders, each carrying four high speed tools.

this lathe in 45 minutes complete.

The operation of turning the crankpin in a driving wheel is shown in Fig. 3, for which a Niles 90-in. journal turning lathe equipped with quartering and pin turning attachment is used. This is a standard type machine, the feature of the job under discussion being, of course, that the pins can be turned in exact relation to each other. Each crankpin is turned by two tools located opposite each other and each tool is mounted in a tool holder with independent adjustment. Tool holders are mounted in tool slides which are adjustable to accommodate various crankpin diameters and the tool slides are mounted on the end of a hollow sleeve with an opening large enough in diameter and deep enough to accommodate the largest diameter and longest crankpins in use. Each sleeve is driven by its quartering spindle and is mounted in a brushed bearing or saddle having sufficient horizontal travel so that crankpins up to 24 in. in length can be turned.

Figure 4 shows the operation of planing a cylinder saddle for valve seats. For this operation a standard Morton 60-in. cylinder planing and boring machine is used, equipped with a self-centering fixture for locating from the center of the cylinder bore as shown. Thus all subsequent operations of planing are performed with the cylinder chucked, ensuring the planing of the cylinder parallel with the center line of the bore. The planer is designed so that a locomotive cylinder can be machined complete on this machine with the exception of drilling. However, a drilling attachment which can be applied to the end of the ram in place of the cutter head makes it possible to drill

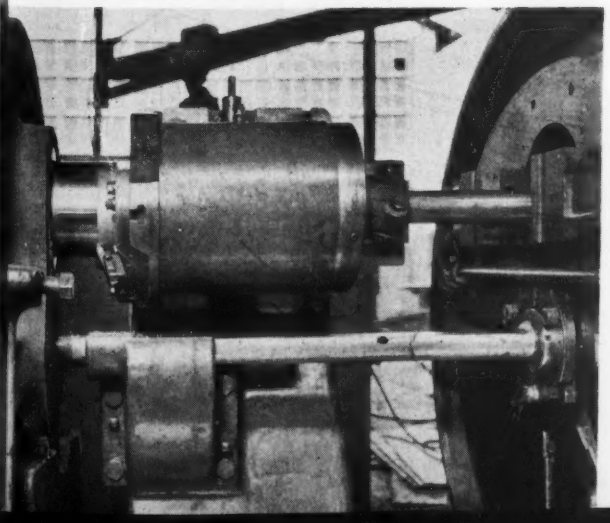


Fig. 3 — Close view of the crankpin turning operation as performed in a Niles quartering machine.

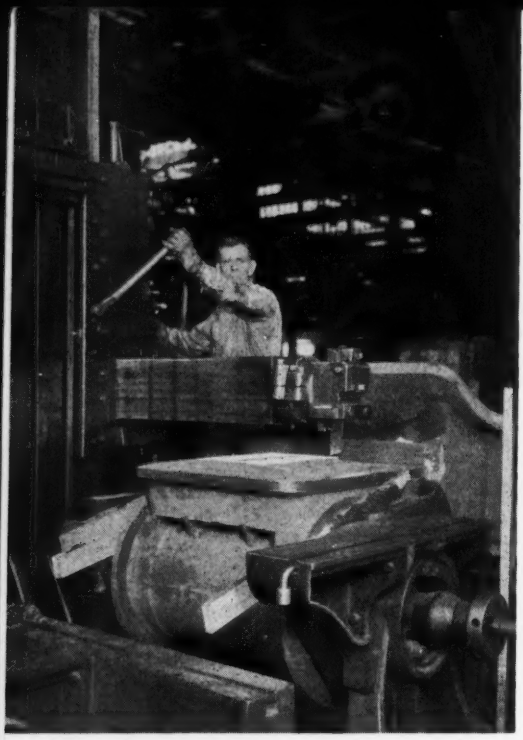


Fig. 4 — Planing a cylinder saddle for the valve seats.

the radial holes in the smoke box fit.

An Ingersoll planer-type miller, at work on the milling of a pair of locomotive side rods, is shown in Fig. 5. Not only all types of rods, but also shoes and wedges are machined on this miller, a wide range of Ingersoll inserted tooth cutters being available for the various operations required.

Ingersoll 9 x 24-in. helical inserted tooth cutters are used for the operation shown.

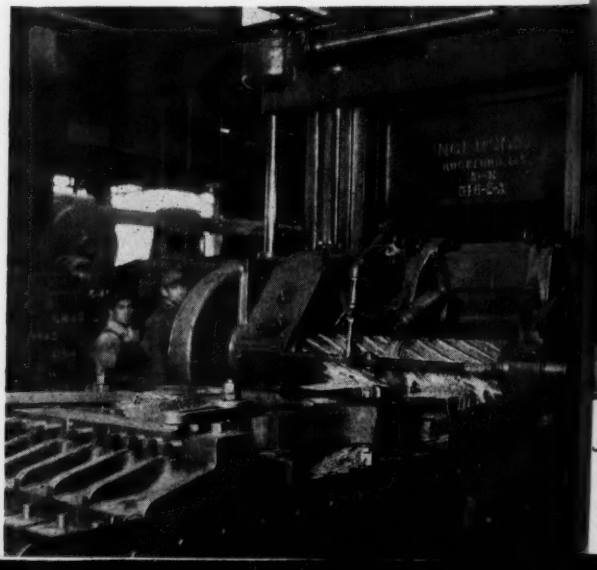


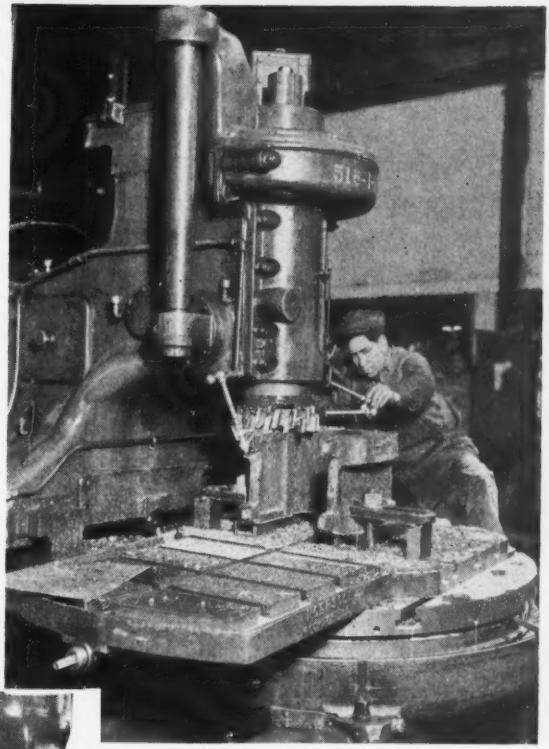
Fig. 5 — Main and side rods are machined on this modern Ingersoll horizontal spindle milling machine.

With these cutters, feeds as high as 8½ in. per minute can be used if necessary, although a slower feed is usually used in order to obtain a smooth finish.

Driving boxes are machined on the Ingersoll vertical milling machine shown in Fig. 6. When equipped with a 4½-in. left hand spiral end milling cutter, this machine is also used to mill out the apertures in the ends of main and side rods.

The heavy vertical spindle is mounted in a housing which may be adjusted horizontally on the base of the machine and the 54-in. circular table is carried in a slide which moves at right angles to the spindle housing and may be rotated by hand or power. This combination of movements makes it possible to mill any contours necessary in finish-

Fig. 6 — Milling driving boxes in an Ingersoll vertical miller.



ing locomotive rods. The spindle may also be fed vertically by power for boring. All control levers can be reached from the operator's position. Nine spindle speeds and 12 feeds are available through sliding gears and pick-off gears, in addition to the quick adjustment provided for the spindle slide and table feed.

Another example of the modern type of machines with which this plant is equipped is the "American" triple-purpose radial drilling machine shown in Fig. 7. This machine has a 5-ft. arm, mounted on a 15-in. diameter column, and is motor driven with the motor mounted on the arm and connected to the six-speed gear box—also on the arm—through multiple V-belts. The characteristics which particularly adapt this machine to railroad shop operations are the centralized controls which make it possible for the operator to control every function of the machine from

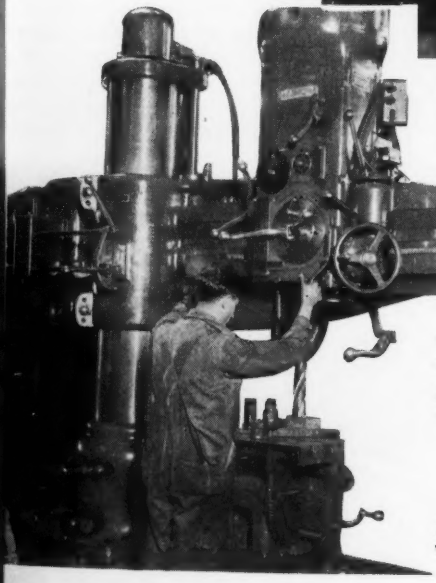


Fig. 7 — Especially adapted to railroad shop work is this "American" triple-purpose radial drilling machine.

Fig. 8—Face milling cutters up to 30-in. in diameter and up to 7 in. wide on the face can be sharpened in this machine in a single setting. The design of the machine is such that corners may be ground square, angular or within any radius up to 2½ inches.

his working position. The machine has a patented dual drive for the spindle with a large internal gear drive for the low speed ranges. The internal gear drive is ideal for the large boring, facing and trepanning operations frequently encountered in locomotive maintenance work.

Cutters for the large planer-type and vertical milling machines are kept in condition with the aid of the Ingersoll cutter grinder shown in Fig. 8. Here the machine is shown in process of grinding a 20-in. inserted tooth milling cutter.

This grinder is designed not only for straight, vertical, or horizontal grinding, but also so that any radius desired can be obtained on the work; thus cutters up to 30-in. diameter and with a maximum peripheral face of 7 in. can be ground at any angle or at any radius up to 2½ in. without changing the initial setting of the cutter.

To aid in maintaining the large milling cutters, the grinder shown in Fig. 9 was designed and built in this shop. The cutter is swung between centers, as shown, and the grinding wheel is mounted on a carriage which travels the length of the ways. Individually motor driven, power is transmitted to the grinding wheel pulley from the motor pulley which extends

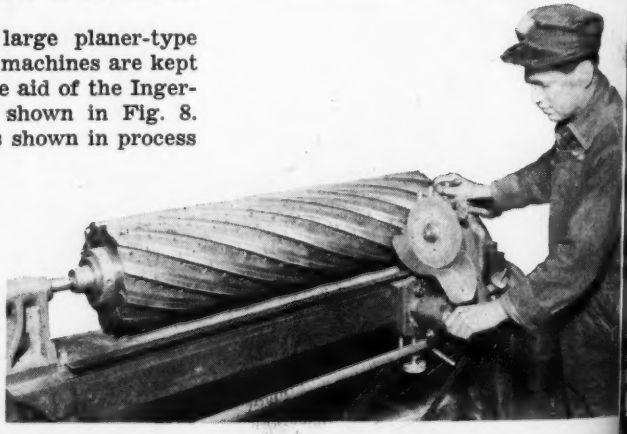


Fig. 9 — This cutter sharpening machine was designed and built in the Mexican National Railway shops.

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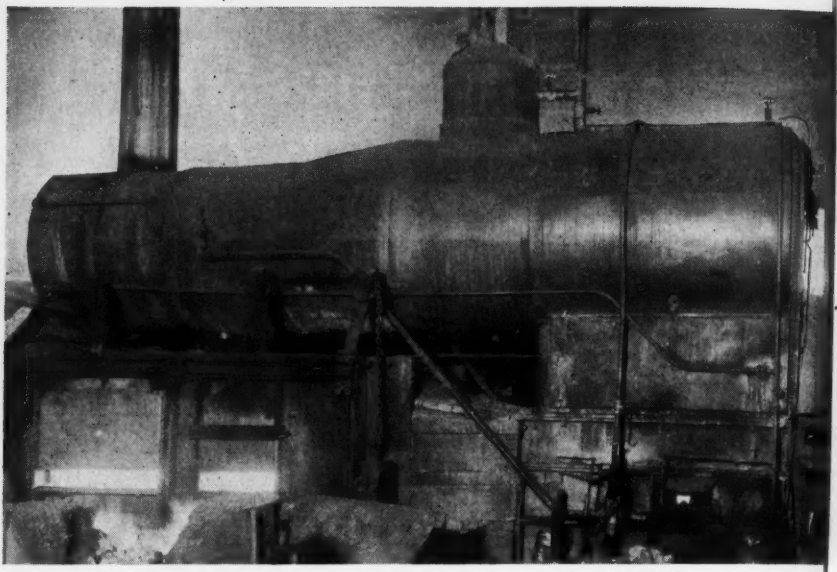
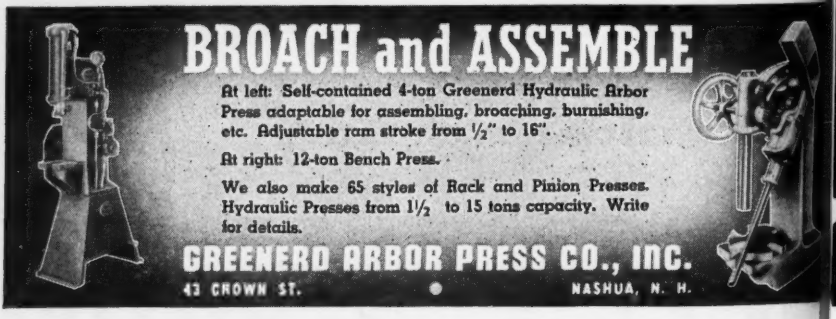


Fig. 10—Free steam with which to operate the steam hammers is obtained by mounting 75 B.H.P. boiler over the furnace in which the parts are heated for forging.

the full length of the machine, underneath. The general design of the machine is apparent at a glance. The illustration shows the sharpening of an 8¾-in. diameter spiral cutter, 36 in. long.

A most ingenious method of obtaining free steam with which to operate the steam hammers in the blacksmith shop is illustrated in Fig. 10. Over the oil-burning furnaces in which the parts to be forged are placed is mounted a 75 B.H.P. locomotive boile from a condemned locomotive, a ranged so that the heat from the fu nace passes through the fire box an thus heats the steam necessary fo the operation of the steam hammer This device produces a genuine sa ing in the course of a year, inasmuc as it eliminates necessity for firin an extra boiler in order to produc steam for the hammers.

In Fig. 11 is shown the air co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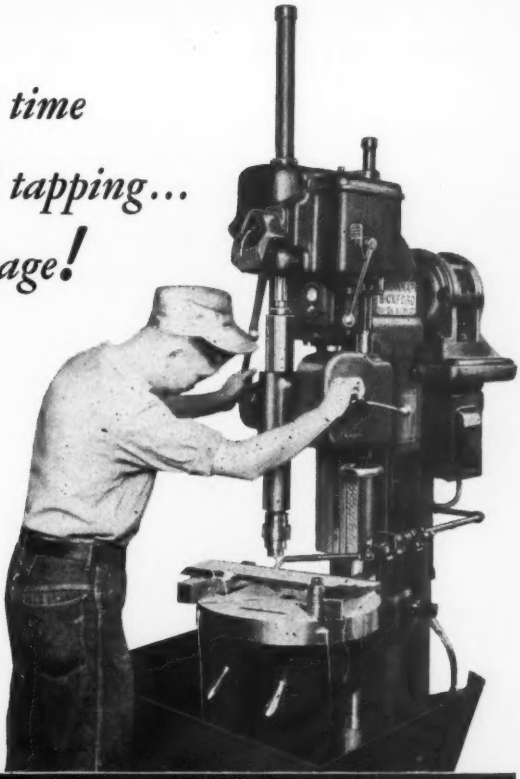

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pressor room, the equipment here consisting of one Chicago Pneumatic Type O-CSC air compressor and two Chicago Pneumatic Type O-CE air compressors designed to produce 1,600 cu. ft. of air per minute each. The pressure above the diaphragms is released, the valves are permitted to seat and compression is resumed.

The equipment and methods used in the making of railway springs at the Monterrey shops of the Mexican

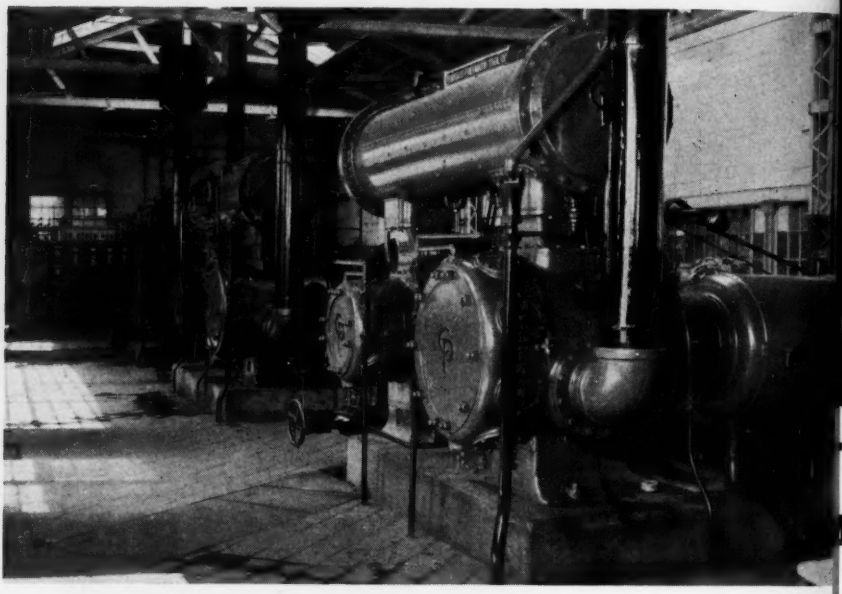

Fig. 11—With a capacity 1,600 cu. ft. of air per minute, these three Chicago Pneumatic compressors supply all the air for the Mexico City shops of the Mexican National Railway.

Type O-CSC compressor is of the horizontal, duplex, side crank design with compound steam drive. The Type O-CE compressors are of the double-acting, water-cooled type with engine-type synchronous motor mounted between the frames. A feature of the Type O-CE compressors consists in that the output is changed automatically to meet variable demands by holding open inlet valves, air pressure being applied above a diaphragm in each inlet valve cover and thus depressing a lifter which forces the valve discs off their seats. When the pressure above the diaphragms is released, the valves are permitted to seat and compression is resumed.

The equipment and methods used in the making of railway springs at the Monterrey shops of the Mexican National Railway will be described in an early issue.

The Oliver ARC Face Mill Grinder developed by the Oliver Instrument Company, 1430 E. Maumee St., Adrian, Mich., to meet the requirements of modern industry for a machine with which modern types of production face milling cutters can be ground accurately and economically, is fully described and illustrated in an eight-page bulletin now being issued by this firm. The text explains every detail in the construction and operation of the machine. Copy of the bulletin free to plant executives or engineers upon request.

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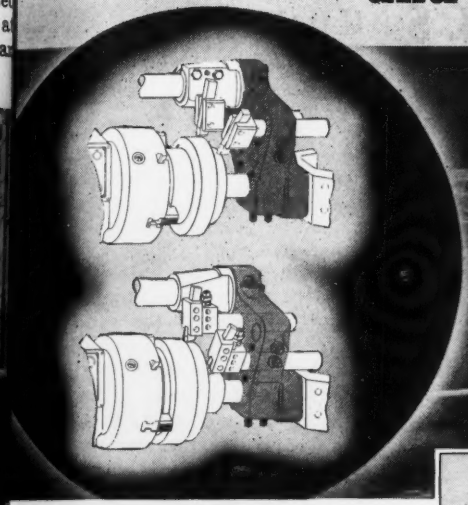

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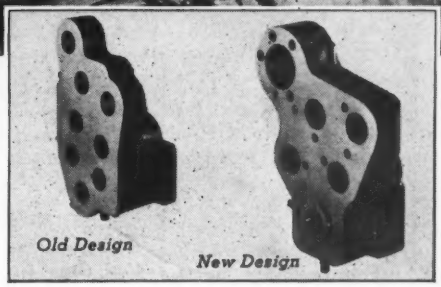

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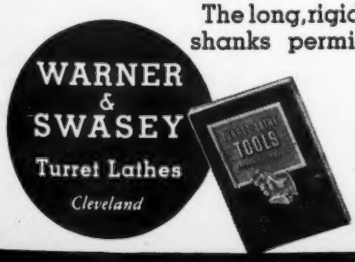


This new Tool Catalog and Manual will be sent free on request.

Abrasives *and the* Modern Age

By Dr. A. D. Duschak
The Carborundum Company, Niagara Falls, N. Y.

PROGRESS in the field of abrasives since the World War is so much a part of the progress in all the fields of industry that we can hardly think of it apart from this larger relationship. Since the war there has been a tremendous impetus to the extended application of mass production methods, not only to the manufacture of the automobile but to household utilities and all other standard articles. Labor and machinery have become more and more specialized and the machine has become more and more automatic. Mass production requires that machine parts must be interchangeable and therefore that they must be shaped and finished with a refinement of accuracy never before demanded. In fact the whole concept of mass production may be said to be founded on accuracy. In no field of industry has this been truer than in the fabrication of metals, in which the greatest refinements of development have occurred in the period since the war.

Every development in machine production has had its influence on the manufacture of abrasives. Mass production has placed its problems in the lap of the abrasive industry which has had to meet the requirements for accuracy of finish and interchangeability of parts by the development of greater and greater refinements in the processes of grinding and finishing. Hence the grinding machine has become increasingly important in some fields of the metal industry which have gone over from craftsmanship to mass production.

Not only has the number and variety of articles to be ground increased enormously; the materials from which these articles are made have also changed and have required new grinding tools and new abrasive materials. The expansion of mass production methods has been accompanied by a continual development of new material for the articles produced and for the tools used in producing them. Steel for machine tools and other purposes has under-

Dr. Duschak, after graduation from college, worked for The Carborundum Company in the Chemical Department for six years and later—in 1929—received the degree of Doctor of Philosophy in Chemistry from the University of Minnesota. Since that time Dr. Duschak has been engaged as Technical Librarian, particularly with the patent art as related to the technique of grinding; thus the author is especially fitted to discuss the more recent developments in the field of abrading.

gone an evolution from low carbon steel to harder high carbon steel and finally to the great variety of still harder and tougher alloy steels. Non-ferrous alloys have undergone a parallel development and expansion. Many new alloys of the lighter metals, to mention one class only, have been developed in the direction of modifying the properties of the metals to make them harder and stronger, and they are constantly increasing in number and complexity. It has been the work of the abrasive manufacturer to keep pace with this evolution by providing the abrasives best adapted to grind and finish all these new materials.

An abrasive wheel is composed of particles of hard, sharp material (abrasive grain) united into an integral structure by a cementing medium usually referred to as the bond. There are two important commercial abrasives, silicon carbide and crystalline aluminum oxide, both products of the electric furnace. The properties of the articles made up of these abrasives can be modified by varying the type and the amount of bond, the porosity and the size and kind of grit used. The bonds in extensive commercial use belong to five general types, vitrified (porcelain or glass), silicate (sodium silicate), resinoid (synthetic resin), rubber and shellac.

In vitrified abrasive products, two major changes have been made within the last twenty years. The first is in the method of mixing and molding the materials. In the older method, called the puddle process, the abrasive material and the bond ingredients (clay, feld-spar or other vitrifiable material) are mixed in the correct proportions and enough water is added to form a soft paste. This mixture is stirred for several hours in a mechanical mixer, poured into a sheet iron mold and dried by heat. The dried wheel is turned or shaved to the right size and shape and then burned in a kiln until the bond is vitrified. This process is gradually being replaced by the so-called press process. In this process very little water is used; the materials are mixed in a specially constructed pan mixer, molded by hydraulic presses under high pressure and the article is then ready for the vitrifying kiln. This method has been used for some time with silicon carbide mixes, but has in recent years been worked up with aluminum oxide abrasives in ranges to cover the entire grinding field. The press process has the advantages of economy of time, labor and working space and a more accurate control of structure, thereby producing wheels of greater uniformity.

Snagging Castings in a Foundry

The second change in vitrified abrasive wheels has been in the direction of producing bonds with increased

strength and better physical properties to meet the demands for higher efficiency and in some cases for higher operating speeds. The properties of these new bonds are such as to cause less interference with the action of the abrasive and thus make it possible to cut down working pressures so that less heat is generated during the

Grinding Billets in a Steel Plant, Using a Swing Frame Grinder

grinding process. The improvement in bond types, combined with greater refinements in the selection of sizes and shape of the abrasive grain, make for greater accuracy of work. The wheels are less susceptible to shock and their elastic properties are improved, giving an increased factor of safety so that for special operations the speed of grinding may be materially increased over the speeds permissible with the older bond types.

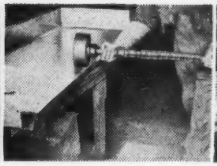
New types of vitrified bond wheels have been developed to meet the necessities of the recent advances in the metal industry. A mix containing selected types of silicon carbide has been developed for grinding cemented tungsten carbide tools and will be discussed more fully a little later. Improved vitrified bonds have extended the use of high purity fused aluminum oxide to the production of wheels for grinding high speed steels and other hard alloys. Individual types have been produced for grinding and finishing stainless steel and iron and there have been innumerable specialty developments for grinding all the new metal products.

One of the largest fields for the use of vitrified abrasive products is in roll grinding. New types of vitrified and resinoid bonds and controlled grain characteristics have made possible the finishing of all kinds of metal rolls by grinding, and the production of surface effects formerly obtained only by lapping. Metal rolls are the heart of many great industries, among them the paper mill, the printing press and all the branches of the sheet metal industry. Sheet steel, copper and all other sheet metals are made by rolling ingots down to the desired thickness of the finished sheet, and the rolls must have absolute accuracy of shape and surface to produce sheets of perfectly uniform thickness. In the older sheet mills most of the rolls were shaped and reconditioned by turning while only a few were ground. The introduction of the continuous sheet mill did two things. It necessitated the use of harder alloys—so hard that they cannot be worked in any other way than by grinding. At the same time the number of rolls required was so greatly increased that their manufacture and reconditioning had to be put on a production basis. Before the continuous mill was introduced a few hundreds of rolls were ground per month in one mill; now the number may run as high as three thousand in a month.

Besides the rolling of ingots into sheets, rolls are used in many cases to give the final finish to the sheet

Inside Grinding

Snagging Castings



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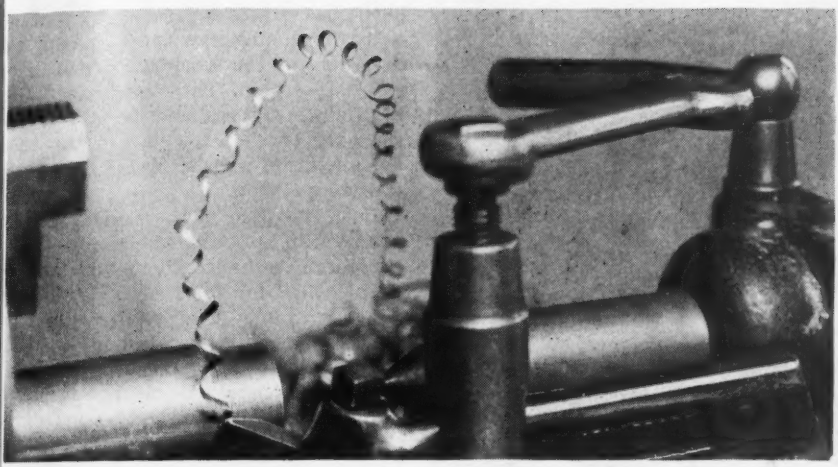
metal. For these transfer finishes an accuracy and a fine finish are required on the roll surface such as we never before dreamed of. By modern roll grinding methods, roll surfaces are finished so that they produce on the rolled sheet a mirror-like luster which could formerly be obtained only by polishing. Steel to be nickel plated or chromium plated now receives the necessary high polish di-

Grinding a Roll for a Steel Mill

rectly from the roll, without any subsequent buffing or polishing. Sheet copper, zinc, monel metal, in fact all types of sheet metal used for decorative effect, may be given their final finish by the roll. The rolling of thin metal foils is one of the most delicate metal working operations. Aluminum foil is rolled to a thickness of three thousandths of an inch—so thin that the slightest imperfection in the roll surface would tear it. Abrasive wheels are manufactured and used for grinding rolls for all these purposes and o all sizes up to huge rolls seventy eight inches in diameter and one hundred inches in length, weighing from seventy-five to eighty-five tons.

We have heard much about the enormous advance in the manufactur of plastics for a great variety of use during the last few years. One of the new uses of plastics, which has resulted in making great improvement in certain classes o grinding wheels, has been the develop ment of synthetic resins for bonds fo abrasive grain. Resinoid bonded type were first investigated with a view t increasing the effi ciency of abrasive wheels used for the grinding and finish ing of metals. In this kind of work the rate of stock remov al of a resinoid bond ed abrasive wheel is much higher than that of a vitrified wheel. The earlies application of the resinoid bonds wa in snagging wheel (wheels for roug grinding such as re moving projections from steel cast ings) and in cut-off wheels (very thi wheels used like rotary saws for cut ting off sections of metals or othe hard materials). The peripheral spee (that is, the rate of travel of an point on the surface) of these wheel runs up to nearly two miles a minut for snagging wheels and half agai as fast for cut-off wheels.

Since the introduction of resinoi wheels their use has been extende to many other fields of grinding, wit



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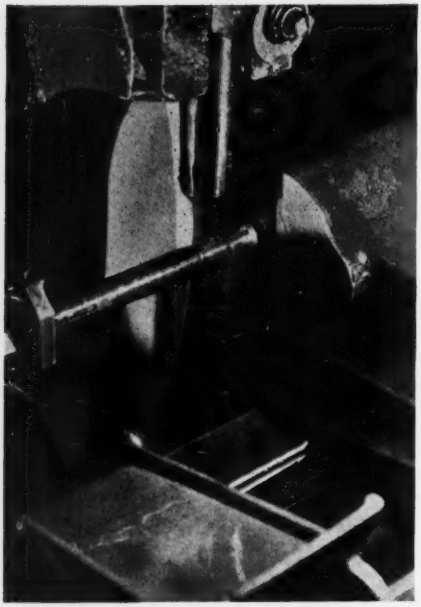

Accuracy and Finish are Features of the Screw Thread Produced in a Thread Grinder

notable success particularly in high finish work such as roll grinding which was discussed above. The synthetic resins most used as bonds are those made by the condensation of phenol with formaldehyde (such as we see every day in the form of jewelry, umbrella handles and hundreds of other useful and ornamental articles), but constant research is continually developing new types and applying them to the work for which they are best suited. The rapid expansion in the use of resinoid bonded abrasives has in turn forced a further development in vitrified bonds to meet the competition.

Both vitrified and resinoid bonds are used in abrasive wheels for grinding screw threads. There has always been a field for the more or less precision grinding of screw threads, but in the past it was more of an art than a production method. In the last few years there has been a tremendous stimulus to production grinding of threaded parts for airplane manufacture, and screw thread grinding has been removed from the field of laboratory craftsmanship to that of production methods. The threads of many bolts in aircraft are now ground to give greater accuracy combined with greater strength. At the same time the tendency has been toward smaller and lighter parts, thus reducing the threaded area and necessitating still stronger threads and close fits. Many other threaded parts for which extreme accuracy is required are now ground. Among these may be mentioned taps, chasers, gauges, roll dies, machine spindles and the fine micrometer screws on measuring instruments.

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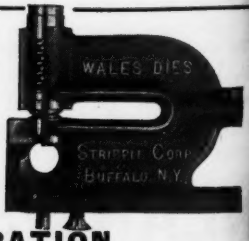

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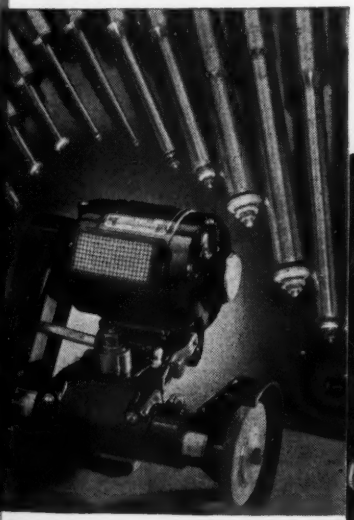

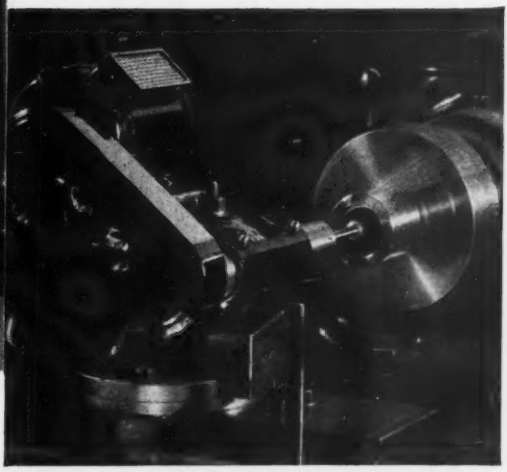

bove is illustrated the No. 5 "Master" rinder with its 12 quick-change quills. At e right this versatile tool is shown in action.

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manufactured abrasives is the grinding of cutlery and all kinds of edged tools. In prehistoric times primitive man sharpened his rude axes and knives on pieces of natural sandstone, and until a few years ago nothing had been found more satisfactory for sharpening a large line of modern edged tools than this earliest known natural abrasive. Two main causes brought about the change to manufactured abrasives: the depletion of the sources of sandstone and the irregularities in the texture of the natural stone. The first use of manufactured abrasives in this field was in the axe industry in which large natural sandstone (up to seventy-two inch diameter) began about 1914 to be replaced by vitrified bond abrasive wheels of twenty-four to thirty inch diameter. The use of manufactured wheels was a few years later extended to cutlery, shears and light edged tools. The first artificial abrasive wheels used for this purpose were of the silicate bond type, and then with the development of new specialized vitrified bonds, very large vitrified abrasive wheels (up to 48 or 54 inch diameter) came into use for many operations for which the silicate wheels were not suited. Since their introduction the manufactured abrasives have proved so much more efficient that they have largely replaced natural sandstone in this field.

Rubber bonded abrasives have been in use for many years. The early types were made by passing the mixture of rubber and abrasive grain through rolls. They had a dense, hard structure which was free cutting because of the breaking down of the bond due to the heat generated by the grinding operation. This type of wheel has a polishing effect and produces a much higher finish than

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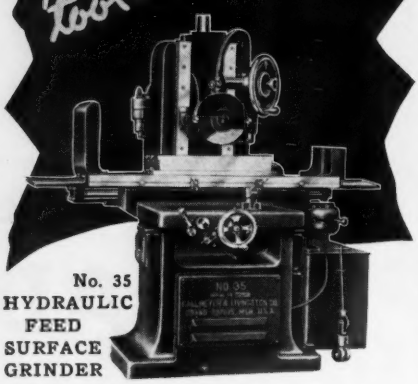

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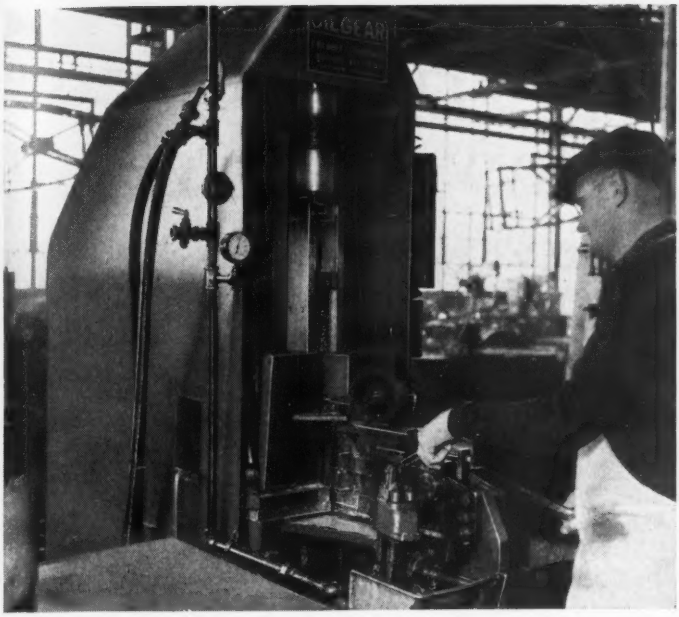
wheels of other bond types. Their high cutting rate makes them useful also in the snagging field. The newer developments in rubber bonded wheels have been directed toward retaining their desirable characteristics and at the same time opening the structure to give a freer cutting action. This has been accomplished by the use of rubber dispersions in making the mix. Satisfactory open types of bond have been developed having a higher resistance to heat and the field has been extended also to wet grinding operations. Because of their elasticity and high strength, rubber bonds have always been suitable for the manufacture of thin cut-off wheels. Rubber bonded wheels are produced not more than .005 to .006 inch thick.

In all types of abrasive wheels the grinding action is conditioned by the ratio of the quantities of abrasive grain, bond and pore space. The porosity of the wheel is being more and more recognized as an important factor in its grinding characteristics and the control of porosity is making it possible to regulate the grinding action to a finer degree than ever before. However, for some purposes a greater proportion of pore space is desirable than can be obtained by regulation of pressure alone. Highly porous abrasive bodies are being made to meet these conditions by adding granular materials which burn out on firing and leave hollow spaces, or substances which evolve gas bubbles in the mix. By careful choice of the kind and grain size of these added materials any desired number and size of pores can be produced in the finished article. By these new methods articles can be produced with the desired grinding characteristics for performing many varieties of work with greater efficiency.

(This article will be concluded in the February number.)



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Modernization of Power Drives

The First of a Series of Articles Dealing With the Development and Application of Modern Power Transmission Equipment

By FRANK E. GOODING

SINCE the dawn of history human progress has been linked inseparably with the application and transmission of power. The first power used was that which, harnessed more scientifically, is still in use today—the force developed by water as it pours down an incline or over either a natural or man-made precipice. But the power was there; the problem lay in finding means to transmit it to a point of useful application.

The natural result of the first thought in this direction was the paddle-wheel, which was soon developed into the large water wheel with a multitude of paddles projecting radially from the circumference. Undoubtedly the first water wheels were hung on axles that also carried round stones which, in contact with other flat or round stones, could be used to grind the grain into flour and thus eliminate the tedious and tiresome task of grinding it by hand. In the course of time it was discovered that, by attaching cogs to one wheel and cutting corresponding slots or grooves in the other, the water wheel could be used to perform a variety of tasks. And by varying the size of the driven wheel, the speed of that wheel could be increased or decreased accordingly.

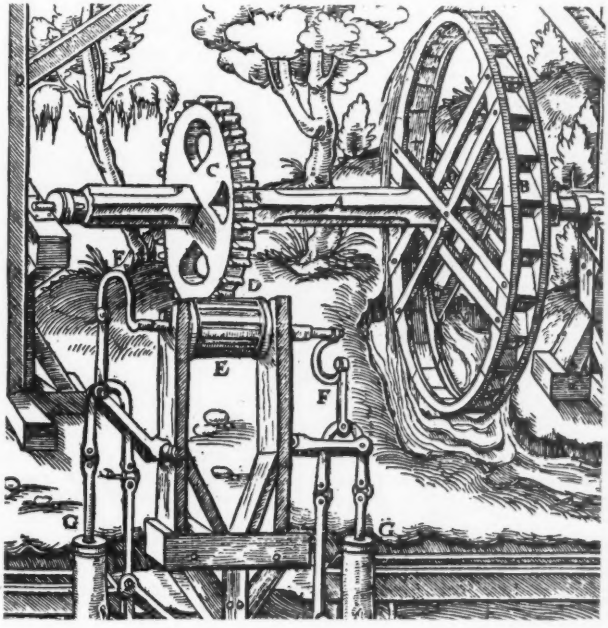
The development of power transmission equipment through the Dark Ages is difficult to trace, but Agricola, in his "De Re Metallica" (1556) illustrated the text with drawings showing the transmission of power from water wheels to various kinds of pumps and other mechanical devices. The transmission of power was effected in this case by the application of toothed wheels to mating cylinders in which "rundles" or straight pieces similar to spokes were used, the teeth of the driving wheel meshing with the apertures between the rundles of the driven wheel and thus forcing it to revolve.

At times, perhaps where no water power was available or where the power was needed only at long intervals, the procedure was reversed and power was multiplied by turning a small wheel which, in turn, drove a larger one in order to provide leverage at the axle of the larger wheel. Agricola's description of the operation was as follows:

"By fitting the end of the lower small axle into the crank, the man who works the crank turns the axle and at the same time the drum, which

rundles turn the toothed wheel of the second axle; by this wheel is driven the one that is made of rundles which again turns the toothed wheel of the upper small axle and thus the drum to which the clamps are fixed."

Up to this time nothing practical had been done in the matter of harnessing steam, but in 1650 a steam fountain was constructed and employed in raising water from the moat to the top of the tower of Raglan Castle (England). The next century saw a succession of improvements in the steam engine, culminating with the development of the double-acting engine by James Watt and the application of his engine to a variety of tasks. During this period the use of the flywheel and belting became common, belting being the principal agent for the transmission of power between shafts.



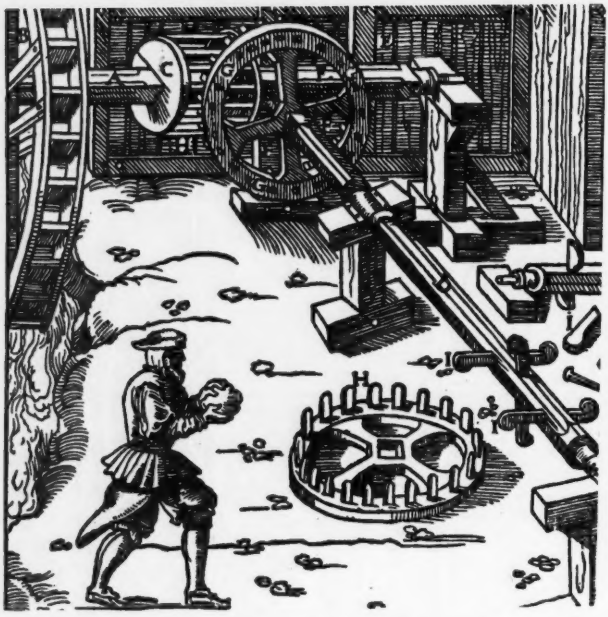
Drawing of Fifteenth Century Water Wheel Driving Pump for Pumping Water Out of a Mine

(Illustration from Herbert and Lou Hoover's translation of Agricola's De Re Metallica, pub. by The Mining Magazine, Salisbury House, London E. C., England.)

The earlier applications of ropes and belts for the transmission of power from the engines and water wheels to the driven shafts necessitated the use of large shafts and bearings, massive clutches and quills, and correspondingly heavy framework for their support. Much of the power produced was dissipated in overcoming inertia and friction of the power transmission equipment alone. Bearing failures which necessitated the shut-down of activities were looked upon as a necessary evil.

Nursing hot bearings until the end of the day and working much of the night to repair or replace them was considered a part of the job by plant millwrights. Difficulties were frequently encountered due to the use of shafts in a variety of diameters varying from perhaps 6 in. down to about $2\frac{7}{16}$ in., making the interchange of clutches, pulleys, bearings, and shaft in many cases impossible.

With the introduction of electrical power, the replacement of steam engines with electric motors became possible, permitting the elimination of cumbersome main drives and the application of power to individual sections of the plant. Later improve-



Drawing of Fifteenth Century Angle Drive

(Illustration from Herbert and Lou Hoover's Translation of Agricola's De Re Metallica, pub. by The Mining Magazine, Salisbury House, London E. C., England.)

ments in motors, particularly in low fractional horsepower ratings, led to their use on individual machine drives. Inaugurated first by the textile industry, results with individual drive were so successful that the individual drive was adopted by other industries and for some years many engineers and industrialists held the belief that only individual motor drives were efficient and up-to-date.

A few years ago, as a result of research into drives and drive problems by a group of engineers, the theory was advanced that in many cases the ideal drive arrangement is to use group drives on some machines and individual drives on others. Putting this theory into practice makes it imperative, however, that the drive problem of each machine be studied individually and its influence on and relationship with other associated machines be determined.

First and of most importance—even more important than the type of drive—is to lay out the arrangement and association of machines for most efficient production and handling of work. As a result, the group often is made up of dissimilar machines, in contrast to the old practice of grouping like

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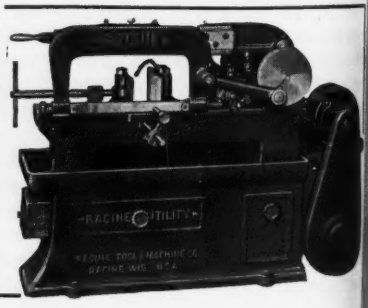

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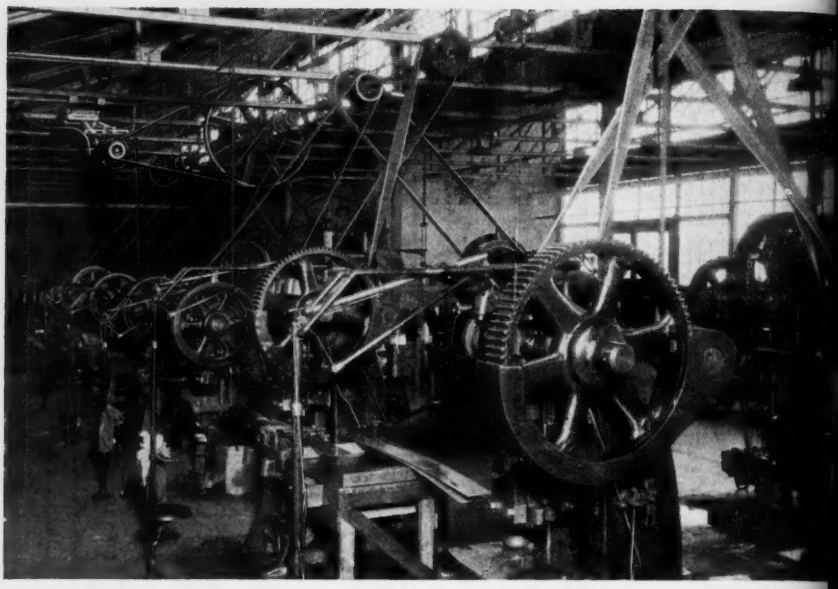

A Good Example of Efficient Group Drive in the Punch Press Department, Service Produc Company, Indianapolis *(Photo courtesy Chicago Belting Company, Chicago, Ill.)*

machines together. When machines are so placed, they usually are arranged in line, or in parallel lines, which makes the group easily adaptable to group drive.

The chief advantage of group lineshaft drive lies in the lower installation costs on which the annual fixed charges are based. Usually, on one shift operation, annual fixed charges comprise the highest single item of operating expense. However, if a machine is equipped with individual drive in order to obtain the maximum possible production, output should not be sacrificed for the original cost advantage which might be obtained by forcing the machine into a group. Probably savings in power and in maintenance, which also are usually to the advantage of group drives, are of less importance than installation costs and resulting annual fixed charges.

The inefficiency of large groups was emphasized during the depressio when low production requirement necessitated operating only a few ma chines at a time. Power losses re sulting from the operation of lon lines of shafting were obvious. Thos who believed that individual driv would have solved this problem over looked the increased fixed charges re sulting from the higher installatio costs. Savings could, however, hav been made by the rearrangement o machines into smaller planned group so that only a few groups need oper ate, with consequent savings in bot power and fixed charges.

The fact that in the majority o cases associated machines are adapt able to group lineshaft drive does no mean that all of these machine should necessarily be group drive Careful studies of drives, machine and production problems indicate th under certain conditions machines o

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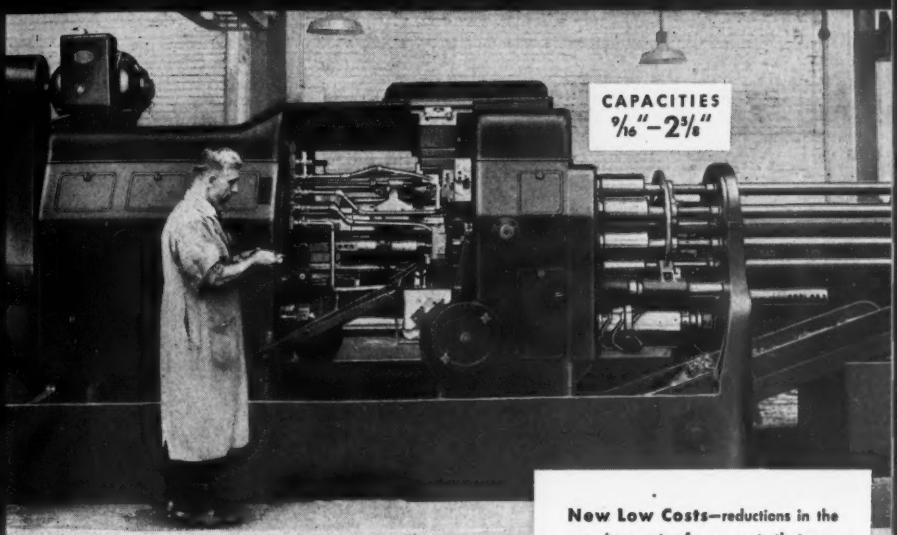

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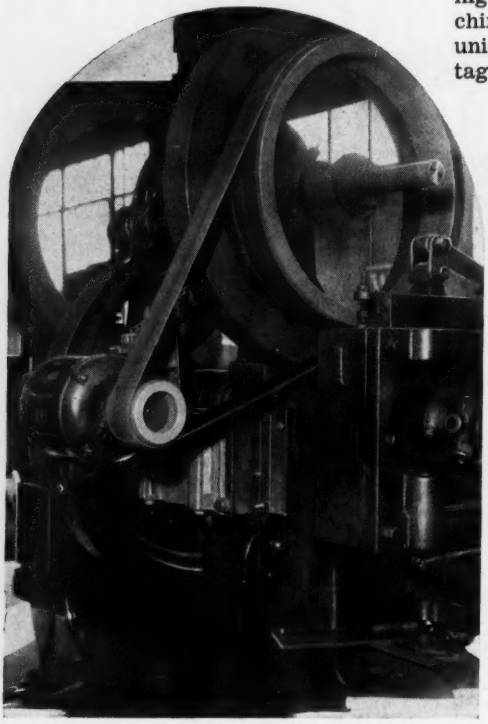
erate to better advantage if equipped with individual drive. For example:

Large machines included with lighter machines in a group and absorbing the major part of the power



Individual Drive, Consisting of Motor Mounted on Rockwood Standard Base Mounted on Side of Double-End Structural Shear
(Photo courtesy Chicago Belting Company, Chicago, Ill.)

for the group, therefore dominating the group power load, usually operate better and produce better results if individually driven. In most cases the associated smaller machines can be group driven.

Where such machines would require 5 to 7½ h.p. motors if individually driven while the other machines operate satisfactorily with 1 or 2 h.p. motors, providing the larger machines with individual drives is better from every standpoint. The figures given are relative.

Where a few machines operate at high speeds compared to other machines in the group, the high speed units usually operate to best advantage if individually driven.

Where one or more machines in a group are operated infrequently and for short periods as, for instance, a small grinder which operates at high speed, individual drive is generally better.

Where one machine must operate at a constant speed, such as a precision grinder, while adjacent machines operate with fluctuating or shock loads, the constant speed machine is better driven individually.

On special machines, particularly those requiring two or more motors or independent sources of power, or which have electrically - timed, automatically-controlled operating cycles, individual drive is recommended. Most woodworking machines and special automatic, multi-operation production machines (not including screw machines) come in this classification.

Where machines are widely separated or operate entirely independently of any other, individual drive is preferable.

Where one or a few of several associated machines may be operated continuously and the others in the group remain idle (usually setting up small, carefully-planned groups will prevent this condition), individual drive is recommended for these few machines.

Where machines are not arranged in lines, therefore necessitating quar-

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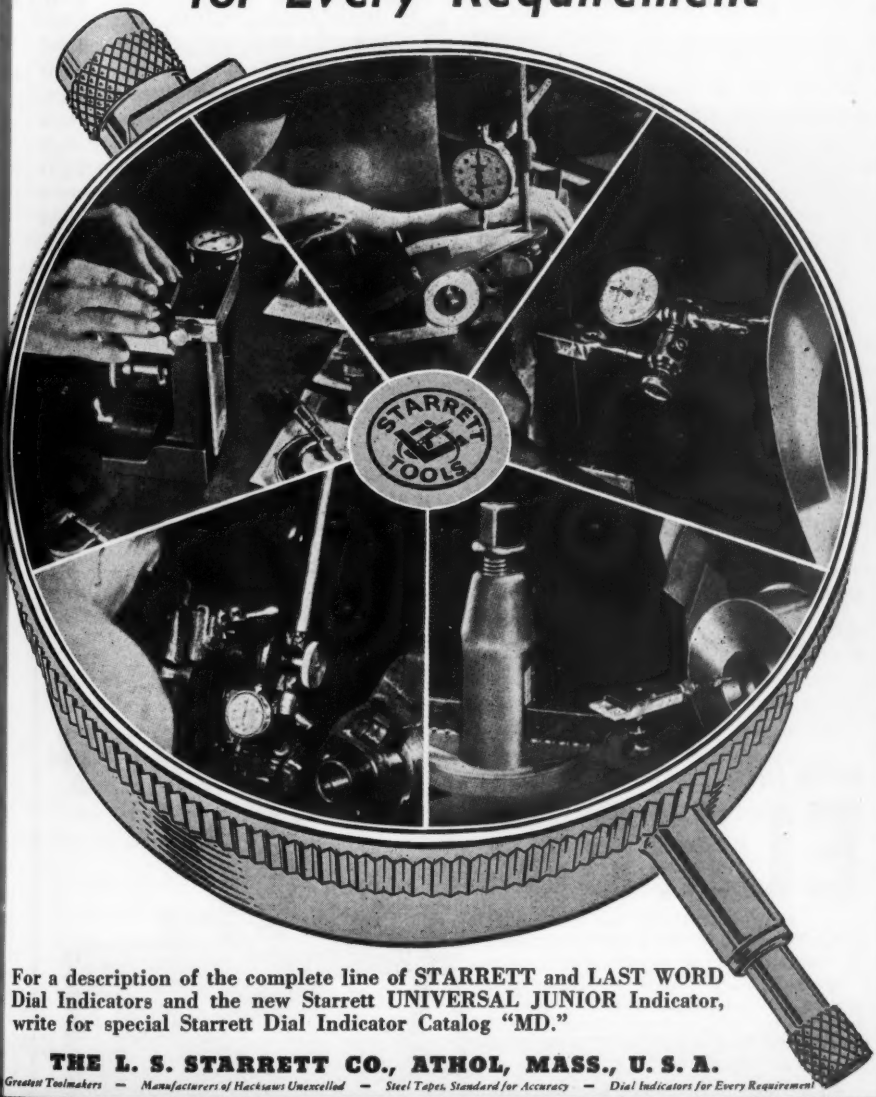

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ter-turn belts or other special arrangements in order to be driven as a group, it will usually be found that some or all of the machines can be driven individually to better operating advantage.

Where one or more associated machines require variable speed, generally these machines operate better if individually driven. However, such variable speed units have successfully been installed in place of the countershaft in lineshaft drives.

Group Drives

Some types of machine readily lend themselves to group drive. For example, machines of approximately the same size and type, or varying in size and type but with no machine dominating the load, can be grouped economically. Machines with fluctuating load, varying from a short peak to practically no load, such as at the beginning of a cut and in the interval between cuts, offer the greatest saving in group drives.

If individually driven, such machines would need to be powered for the heaviest cut or peak load. For example: a given machine may require a 2 h.p. motor for peak loads and at starting, but operate through cuts at about ¾ h.p. load. Eight such machines individually driven would require eight 2 h.p. motors whereas, if grouped, a single 10 h.p. motor would be sufficient and it is in this installation cost that the main savings result.

Savings in the cost of such an installation consist in the cost of one 10 h.p. motor as against eight 2 h.p. motors at a much higher cost per horsepower; one distribution line, starter and wiring cost compared to eight; the cost of one motor mounting against eight, or the difference in

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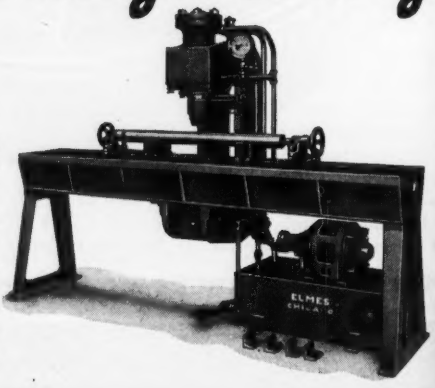
Welded steel frame. Easily controlled and adjusted. Capacity adjustable from 1 to 12½ tons. This type of press can be furnished in a number of larger capacities.

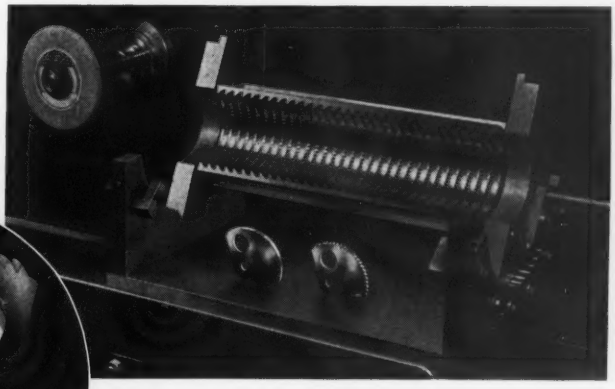
Numerous other features. For full information and data write to the **Charles F. Elmes Engineering Works, 216 North Morgan St., Chicago.**

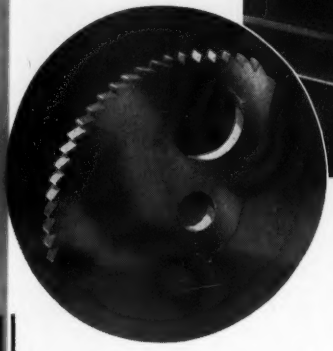


INTRICATE EXTERNAL FORMS
Broached to Extreme Accuracy

At right: The broach in the special grinding fixture. As will be noted, the fixture is not in grinding position but is tilted to show a full view of the broach.

Below: A typical ratchet sector after broaching.





DO you require exceptional accuracy in the broaching of unusual external forms? If you do, here is an example that is truly typical of the results produced by the use of Detroit Broaches. Shown above is a Detroit Broach used for broaching twenty-two teeth in a ratchet sector. On this job, it was absolutely necessary that the external radius and teeth be held to the closest possible limits. To assure extreme accuracy, the special fixture illustrated above was designed for the grinding of the broach, with the result that the tooth spacing was held to a very close accumulated error. The broach, which is made up of four sections, cuts all the teeth in six steel stampings at one time and produces approximately one thousand pieces per hour.

In high production or low production, Detroit Broaches will meet your most exacting requirements for innumerable jobs involving out-of-the-ordinary external forms. Investigate the possibilities of their use for parts which you manufacture. Your inquiry will receive the immediate attention of our engineering staff, and practical recommendations will be offered with no obligation on your part.

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Universal

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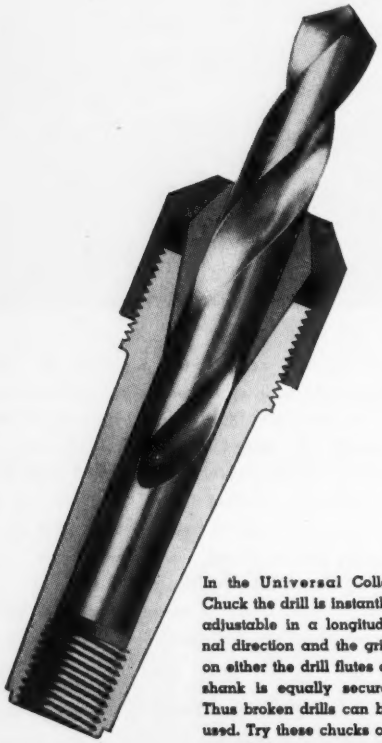

In the Universal Collet Chuck the drill is instantly adjustable in a longitudinal direction and the grip on either the drill flutes or shank is equally secure. Thus broken drills can be used. Try these chucks on your drill press or screw machine.

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cost between eight machines built f individual motors and for lineshaf drive. This cost of motor mountin ordinarily runs from $50 to $200 more per machine and in most cas totals about the same as the cost installation of the lineshaft.

Chief precautions necessary in i stalling group drives are to see th groups are kept small, seldom inclu ing more than eight to ten machine that machines are associated proper for the work to be done; that an friction bearings be used and alig ment of shafts be maintained; th good belts be used and serviced reg larly to keep in satisfactory drivi condition. If these factors are tak into account and engineered proper group drive is an economy; if ine ciently grouped and maintained, wo handling and other losses will be f more expensive than the drive a will not be prevented by the selecti of either group or individual drive.

Airco Equipment. Air Reduction Sal Co., 60 E. 42nd St., New York, N. has announced the publication of t new catalogs (price lists separate), co ering the entire line of Airco weldi and cutting apparatus and supplies.

Catalog 22, which contains 32 p fusely illustrated pages, depicts ha welding and cutting torches and ti pressure regulators, fluxes, rods a other supplies. Eight complete outf covering the entire range of industr uses are shown, and in addition will found valuable information and illustr tions of portable oxygen and acetyle manifolds, circular cutting attachmen cylinder trucks, torch extensions, a so on.

Catalog 21 is designed to assist large user of oxy-acetylene equipme and electric arc welding machines. contains 64 pages which show, in ad tion to those items in Catalog 22, ad tional information dealing with acetyle generators, industrial gases, and ac acetylene machines. Several pages a devoted to pipe line safety devices, t pages on National Carbide, and two Wilson arc welders. Copies free up request.

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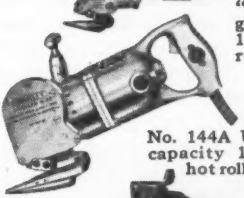
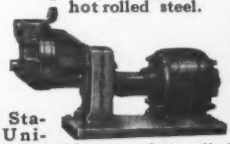
Stanley Unishears, portable and stationary, make records wherever sheet materials are cut. They do the job quicker, cleaner, easier and at lower cost. Ask for a demonstration, or write for literature. Stanley Electric Tool Division, The Stanley Works, 137 Elm Street, New Britain, Connecticut.

"Might Midget," capacity 18 gauge hot rolled steel.



No. 144A Unishear, capacity 12 gauge hot rolled steel.



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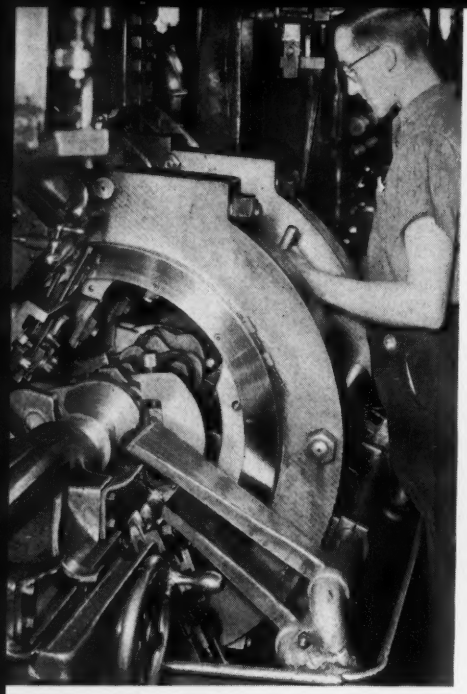

Fig. 13 — The crankshaft main bearings and cheeks are turned and faced in this LeBlond special crankshaft bearing lathe.

Most Modern Production Plant Layout

Second Half of Article Describing Production Methods and Equipment at New International Harvester Truck Engine Works in Indianapolis

THE main bearings on the crankshaft are machined in the LeBlond special crankshaft bearing lathe shown in operation in Fig. 13. This illustration shows details of the tool set-up for turning and facing all main bearings simultaneously together with the diameters on the flange end and pulley end of the crankshaft. The shaft is held on centers in the machine. The operator clamps the shaft in position and starts the machine, upon which the tools feed to cutting position and start cutting immediately.

With tools located in slides at the lower front of the machine in which they feed upward toward the work, and tools located in slides at the upper rear of the work in such position that they feed downward, provision is made for turning and facing simultaneously on all bearings and cheeks. The machine stops automatically at the end of the operation. In this operation the bearings are turned to within 0.010 in. of the finished size, leaving this amount of stock for finishing on the grinder, the turning operation being held within 0.003 in. of the drawing dimension.

In Fig. 14 the operator is shown in the act of locating a camshaft in position in a Landis hydraulic grinder for the purpose of grinding the cams. The machine is so designed that the shaft is rocked automatically in order to produce the exact contour, at exactly the right angle, on the cam face. Electric mercury gages size the work automatically and when a cam is finished the wheel automatically backs away, the work indexes to the next cam, and the wheel starts operating again. There are 12 cams and one eccentric to be ground on each shaft. Thus all the cams on a shaft are

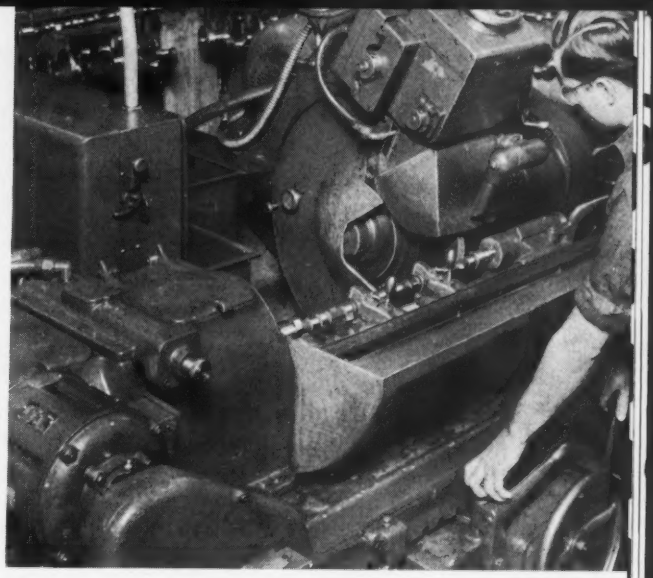

Fig. 14 — Equipped with special mechanism, this Landis grinder grinds all the cams on the camshaft to the correct size, indexing from one cam to the next automatically until the entire shaft is completed.

ground automatically.

The hydraulic mechanism makes it possible to obtain any speed desired by simply moving a lever. The wheel is trued automatically, the wheel truing device being designed to compensate automatically for the amount of stock removed from the grinding wheel. The limit on the diameter of the base circle is 0.001 in., with a limit of 1 in. on the cam angle.

The illustration Fig. 15 shows the two special four-station Ex-Cell-O machines built especially for the International Harvester Company for finish turning, finish facing and finish grooving the pistons. The machines are hydraulically operated and the pistons are held in air chucks for machining; thus the manual operations are reduced to the minimum.

Four pistons are machined simultaneously in each machine, the ring grooves and piston lands being finished while the turning operation is in process. The entire operation of the machine is automatic, the tools moving into position and proceeding with the operation upon the movement of a lever. They also automatically back off at the finish of the operation. Firthite tool bits are used for the turning, facing and grooving operations.

Pistons are finished to size by

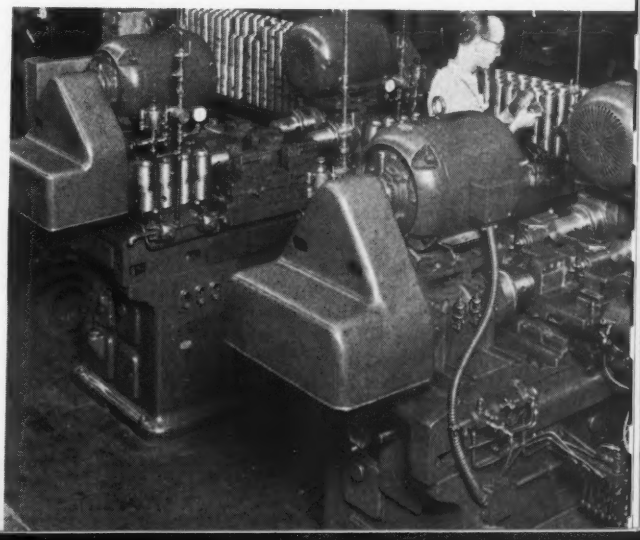

Fig. 15—Pistons are turned, faced and grooved in these two special four-station Ex-Cell-O machines.

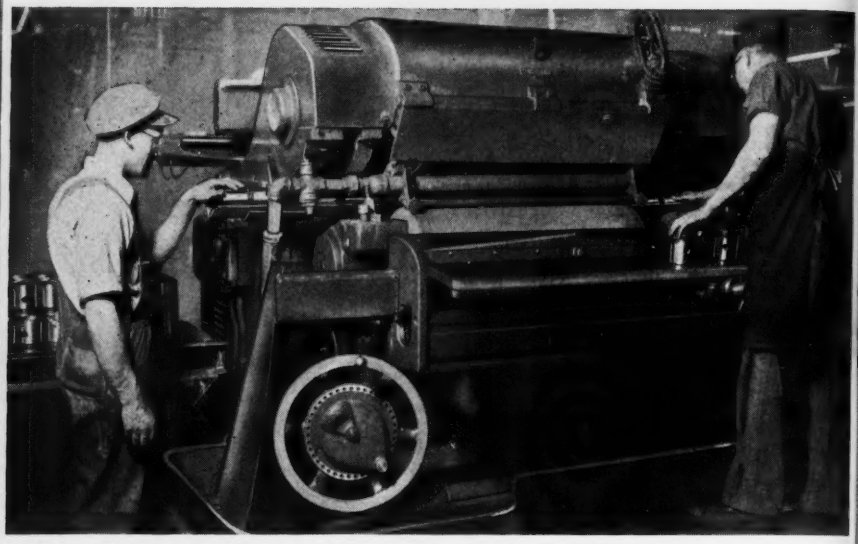

Fig. 16—Cincinnati centerless grinding machine designed especially for grinding pistons to size.

grinding in the Cincinnati centerless grinding machine shown in operation in Fig. 16. The machine was especially designed for piston grinding and presents definite advantages in the saving in time, floor space, and labor requirements. The grinding wheel is made up of six wheels, each 4 in. wide, combined on one spindle to make a 24-in. wide wheel. The wheel is mounted on the upper spindle and the rubber-bonded regulating wheel, which is an assembly of six 6-in. wide wheels, is located on the lower spindle.

When new, the grinding wheel is 24-in. diameter and the regulating wheel is 16-in. diameter. The wheel is a Carborundum vitrified wheel, No. B-80-SE-½, and the regulating wheel, also made by Carborundum, is known as an Aloxite rubber-bonded wheel, No. 80-KC. Both wheels are dressed by means of a hydraulic profile truing attachment comprising a cylinder and piston, the piston being connected to the truing member which moves across the face of the wheel.

Pistons are fed into the machine by placing them in the trough at the left end, as shown, and are removed from the trough at the opposite end as they emerge from the wheels. While the piston is in contact with the regulating and grinding wheels it rests on a blade extending the entire length of the regulating wheel. The speed of the grinding wheel is approximately 1,050 r.p.m. and that of the regulating wheel is 47 r.p.m.

The feed angle of the regulating wheel is so adjusted that the work feeds through the machine at approximately 50 in. per minute. One rough and one finishing cut are taken on each piston, from 0.003 in. of 0.004 in. of stock being removed at each pass. Hourly production is 350 finished pistons per 50-minute hour. The pistons are held to within 0.0003 in. for size, 0.0005 in. for roundness, and 0.0002 in. for straightness. The cool-

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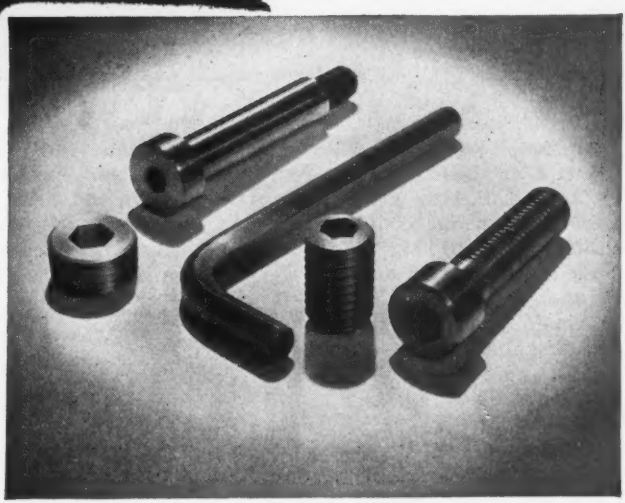

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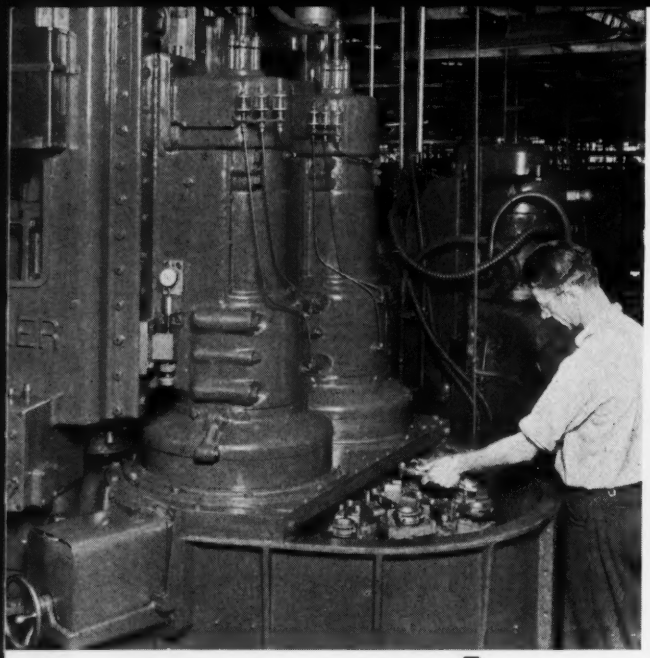

Fig. 17—Gardner continuous double-wheel grinder in which the sides of connecting rods are finished. Eight rods are ground complete on both sides with each revolution of the table.

ant used is a solution of soluble oil, water and Oakite.

The sides of the connecting rod bearings are finished by grinding in the Gardner continuous double-wheel grinder illustrated in Fig. 17. The machine is equipped with a multi-station rotary fixture for rough and finish grinding, half of the fixtures being set for grinding one side of the rod and the other half of the fixtures, alternately located on the table, set for grinding the second side of the rod. There are 16 clamping positions; thus eight finished rods are produced at each complete revolution of the table. Clamps are cam-operated; the operator simply sets the rod in the fixture underneath the clamp which, at loading position, projects high enough to allow plenty of clearance for inserting the rod. As the table revolves carrying the work to the grinding wheels, a cam mechanism pulls the clamp down and locks the rod in place. As the rods come again into unloading position, the cam mechanism again releases the clamps. The work moves

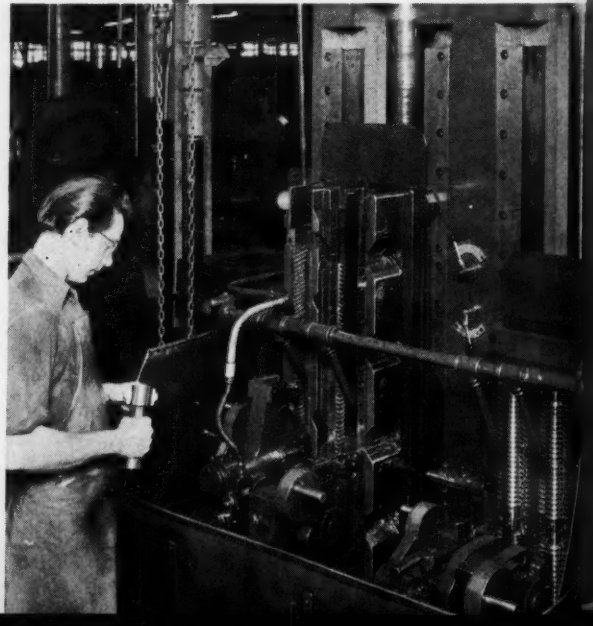

Fig. 18—In this Colonial double hydraulic broach the connecting rods and caps are machined on the sides, contacting faces, and in the radial bearing seats.

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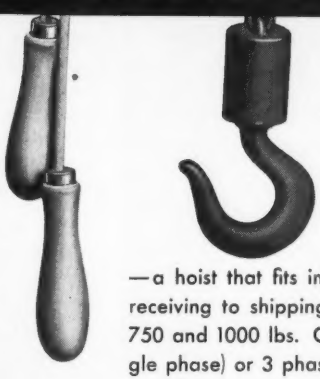

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past the wheels at a speed of 310 surface feet per minute.

Crankshaft bearing seats and faces are machined by broaching in the Colonial hydraulic broach shown in operation in Fig. 18. This is a double machine, arranged so that the rams work alternately; thus the tools on one side of the machine are cutting while the work is being changed on the other side of the machine.

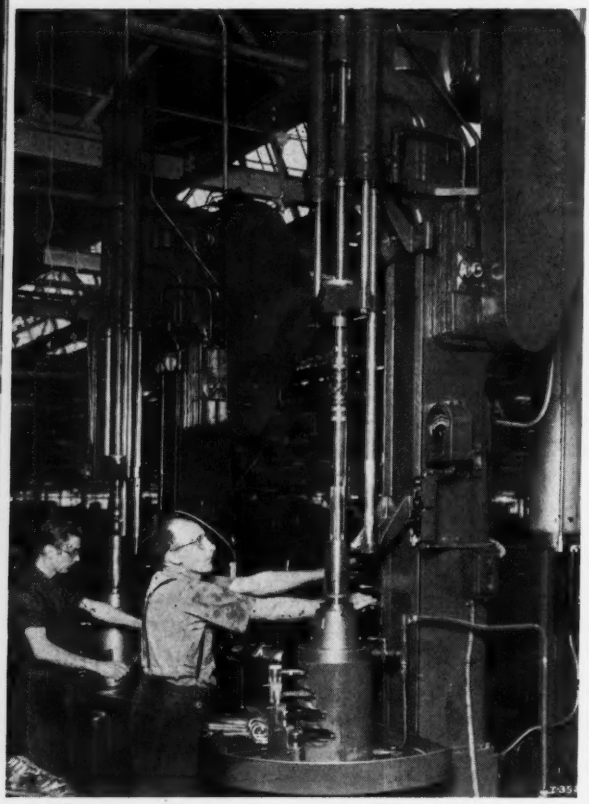

Fig. 19—The crankshaft bearings in connecting rods are finished by honing in these two Barnes vertical honing machines. The fixture is designed to hold four rods for honing simultaneously.

Altogether there are four stations. In the first station the rod and cap are held so that the sides of the main bearing end are broached to produce a rod of the correct thickness; in the second position the rod and cap are broached on the contacting surfaces. In the third position the radial bearing seat of the rod is broached, and in the fourth position the radial bearing seat is broached in the cap.

In each position the rod is clamped by a single movement of the handle on the clamping device. The clamp is weighted, as shown, the weight being sufficient to hold the clamp during the operation, but easily moved by hand for unclamping. The operator is shown in the act of unclamping the rods in the first two stations, just after the operation has been completed. The broaches finish the surfaces within 0.002 in. of drawing dimensions, the radial bearing surfaces being honed to size after the rods and caps have been assembled together.

The honing operation on the crankshaft bearing end of the connecting rods is performed in the Barnes vertical honing machines shown in Fig. 19. The fixture is arranged so that four rods can be clamped in position and honed simultaneously, as shown, each rod being located for center distance by a locating pin which fits into the crankpin end of the rod. The hone is revolved and reciprocated simultaneously, producing practically a mirror finish in the bearing hole. Removing 0.002 in. of stock, the bear-

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Fig. 20—A $\frac{3}{16}$-in. oil hole is drilled the full length of the connecting rod in one of these machines, each machine having six spindles. The machine is a special Pratt & Whitney rifle drilling machine.

ing is held to within limits of 0.001 in. for size and concentricity. Each rod is tested on the micrometer dial test fixture shown in the illustration between the machines.

One of the most interesting operations in the production of parts for the International truck engine is the rifle drilling of the $\frac{3}{16}$-in. oil hole which extends the full length of the connecting rod connecting the crankshaft bearing end with the piston end. This hole is drilled in a Pratt & Whitney special rifle drilling machine, a battery of which is shown in Fig. 20. The drill is a rifle drill, with straight flutes, and having a hole extending throughout the length of the drill to carry coolant to the cutting edges; thus the point of the drill is flooded continuously with oil.

The machine not only drills and stops at the end of the operation automatically, but also automatically frees the tool of chips periodically throughout the operation. Each one of the machines shown has six spindles, the operation being long enough so that the operator can unload and load the five fixtures in sequence. Thus four spindles are running continuously while the fixture at the fifth station is being loaded.

Inasmuch as a great deal of the noise of running machinery is caused by the meshing of gear teeth, it is obvious that noise can be reduced if the teeth of the gears can be so finished that they will mesh and unmesh silently. To assist in accomplishing this end, the Michigan Tool Company has developed a gear finishing machine, shown in Fig. 21, in which cutters perfectly shaped and arranged in the form of a rack can shave the teeth of a spiral gear to the desired contour by running the gear in mesh with this rack.

As the gear is fed back and forth across the machine, any high spots or tool marks in the surface of the gear tooth are eliminated as they pass the

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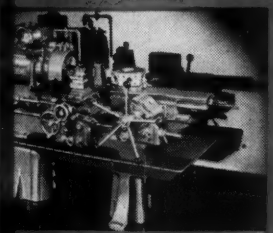
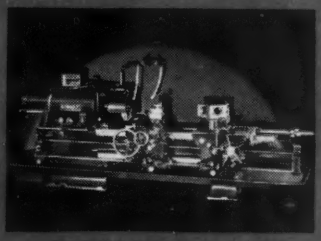
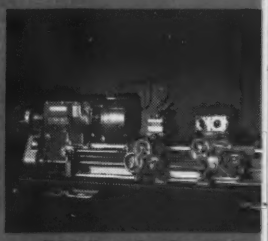


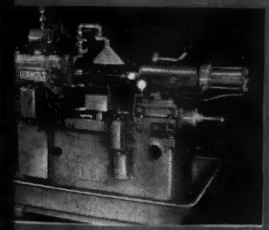
Gisholt Universal Ram Type Turret Lathes
3—1½" x 10" bar cap., 8" or 10" chuck, 18½" swing
4—2" x 12" bar cap., 8" or 10" chuck, 18½" swing
5—2½" x 14" bar cap., 10" or 12" chuck, 19½" swing



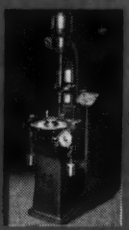
Gisholt High Production Turret Lathes
1L—2½" x 36" bar cap., 12" chuck, 19" swing
2L—3½" x 48" bar cap., 15" chuck, 22½" swing
3L—4½" x 48" bar cap., 18" chuck, 26½" swing

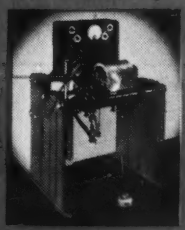


Gisholt Heavy-Duty Turret Lathes
3AL—6¼" or 7½" spindle bore, 21" chuck, 27" swing
4L—9¼", 10½" or 12¼" spindle bore, 24" chuck, 28" or 32" swing
5L—9¼", 10½" or 12¼" spindle bore, 28" or 32" swing
34½" swing



Gisholt No. 12 Automatic Production Lathes
16½" swing x 22" max. between centers.
For either chucking or between centers work.





Gisholt Balancing Machines
Static Balancers—4 sizes
Dynamic Balancers—5 sizes

Gisholt Simplimatic Lathes
Platen type—18" or 24" chuck
Radial type—18" or 24" chuck

GISHOLT
MACHINE COMPANY

1219 EAST WASHINGTON AVENUE, MADISON, WISCONSIN, U. S. A.

TURRET LATHES · AUTOMATIC LATHES · TOOL GRINDERS · BALANCING MACHINES

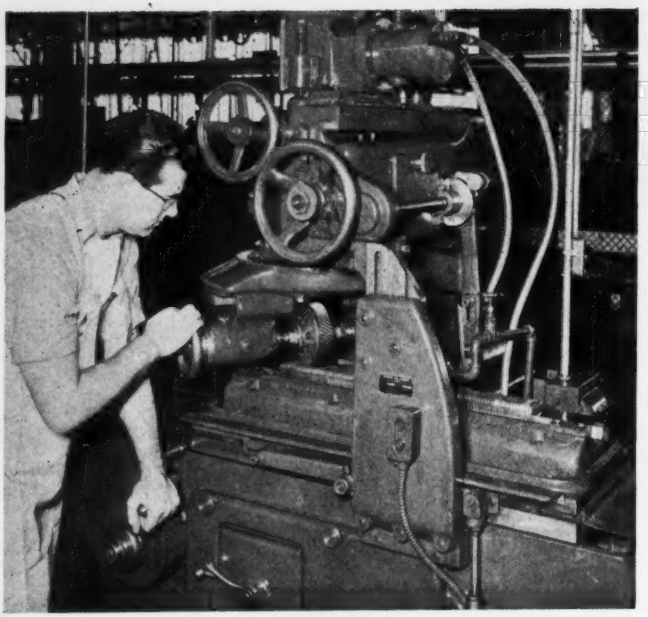


Fig. 21—To elimina gear noise and ma for smoother ope tion of the operati parts, spiral gear te are finished by r ning the gear in me with a rack, the te of which are actua shaving tools.

cutting edge of the tooth-shaped tool in meshing. A maximum of approximately 0.0015 in. of stock is removed and the gear teeth are perfected to a point which makes them much quieter and gives them longer life in service.

The illustration Fig. 22 is a view of the engine assembly department, showing how the parts are assembled to the engine block as it is carried along by a power conveyor. The block is clamped to base hinged b tween the sid of a rack or ca rier, the base a its hinged pi being so design that the weig above and belo the center poi of the pins w be equalize Thus the engi can be revolv or swung into practically any po tion, or either side up, as may be r quired to reach the parts.

Each operator has a certain amou of working space from his bench a stock bins, starting the operation assembling his parts as the engi enters his working area and compl ing his operation before it passes in the next area. By this means produ tion is maintained at a constant pa

Wire-Working Machinery
Wire Mill Equipment
Sleeper & Hartley, Inc.
Designers and Builders
Worcester, Massachusetts

UNBRAKO

SELF-LOCKING HOLLOW SET SCREW
WITH THE KNURLED POINT

CAN'T VIBRATE LOOSE

PREVENTS BREAKDOWN

AVERTS ACCIDENTS

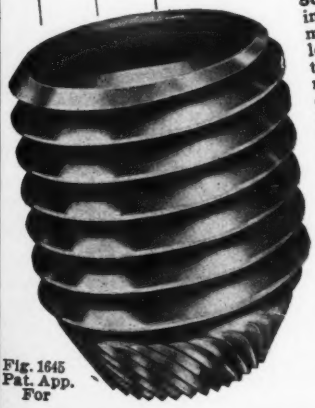


Fig. 1645 Pat. App. For

You can now be sure that every set screw will permanently perform its intended duty. No longer do you need to wonder and worry whether vibration will cause them to loosen. Equip your machines with the new **"Unbrako" Self-Locking Knurled Set Screws.** Ingenious knurling on the cup points automatically and so surely locks them in place, when tightened in the normal manner, that no amount of shaking, jarring or vibration will loosen them. Maintenance men can entirely neglect them without cause for alarm. Yet, these screws can be easily removed for adjustment if desired and reused again and again, indefinitely.

Tests made in innumerable mills and under all conditions prove these facts.

Write us today. Ask for samples, prices and complete details.

Fig. 1646 Pat. App. For

KNURLED POINT

UNBRAKO

SELF-LOCKING
SQUARE HEAD
SET SCREW

Here's another new "Unbrako" product with countless uses. **"Unbrako" Self-Locking Square Head Set Screw.** These also have the knurled points so they stay-put despite the most severe vibration. Can be adjusted as often as required without affecting the locking efficiency. Write for details.

STANDARD PRESSED STEEL CO.

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BOX 556

BRANCHES
CHICAGO
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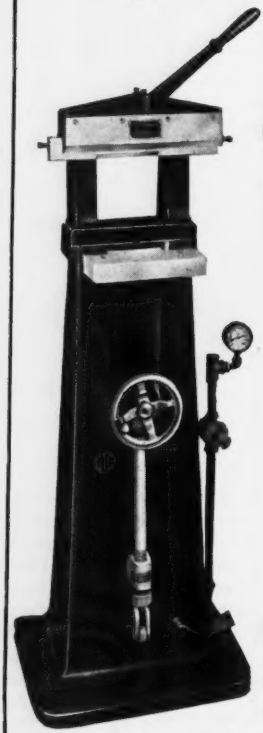
YOUR PRODUCTS
ALWAYS
IDENTIFIED
IF PERMANENTLY
MARKED
IN THIS MACHINE



MARKING BY ROLLING IS FAST AND ECONOMICAL. PRESERVES DIE LIFE AND PIECE PARTS. REQUIRES ONLY FRACTION OF APPLIED PRESSURE AS COMPARED TO STAMPING.

QUICK SET-UPS

MODEL 25
HI-DUTY
MARKING
MACHINE

This machine operates from your plant air line, and is one of numerous models built to produce fast, neat marking on metal parts. Hi-Duty marking machines may be had for practically any marking operation, and we will be glad to make recommendations upon receipt of your inquiries. Send prints or samples of parts to be marked, showing lettering and location, also state required production.

GEO. T. SCHMIDT, Inc.
1806 BELLE PLAINE AVE.
CHICAGO, ILL.

and the engines are moved automatically from the start of the assembly at the beginning of the line, to the completion of the assembly at the testing department.

In the test room, Fig. 23, the engines are given an initial run-in and a thorough test before leaving the factory. Here it is possible to have as many as 117 engines on test at the

Fig. 22—Parts are assembled to the engine as it is slowly moved along by means of a power conveyor. Starting with a bare engine block at the beginning of the line, the conveyor delivers a finished engine to the test room at the end of the line and carries the tested engines from the test room to the shipping dock.

same time. Three two-ton Cleveland cranes provide for removing the engines from the conveyor, setting them in the stands, and carrying them to the exit conveyor when the test is completed.

Water and oil are delivered at the proper temperature and pressure from a central system installed in the basement directly below the test room. Ignition and starting current for the engines on test are supplied by two

ROSS Air Control VALVES—with POSITIVE SEAL

NO LEAKAGE

Positive seal of valve seats is assured by full line air pressure. Metal cup washers, in which synthetic, oil resistant rubber has been permanently vulcanized, afford perfect seating, prevent leakage and give exceptionally long life.

All ports on one face permit gang mounting in minimum space—easy to install. Short throw makes Ross the ideal valve for mechanical control. For easy, positive action, and speed in the operation of your air actuated equipment, install Ross valves.

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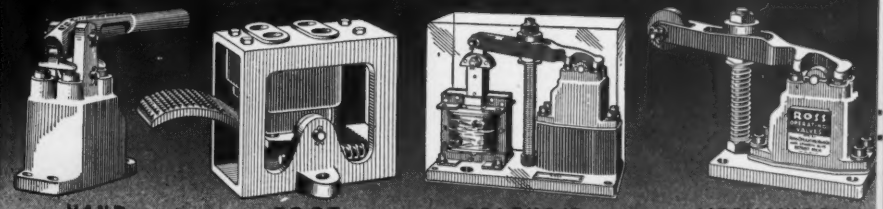


HAND CONTROL | FOOT CONTROL | SOLENOID CONTROL | MECHANICAL CONTROL

A SIZE AND TYPE FOR EVERY OPERATION

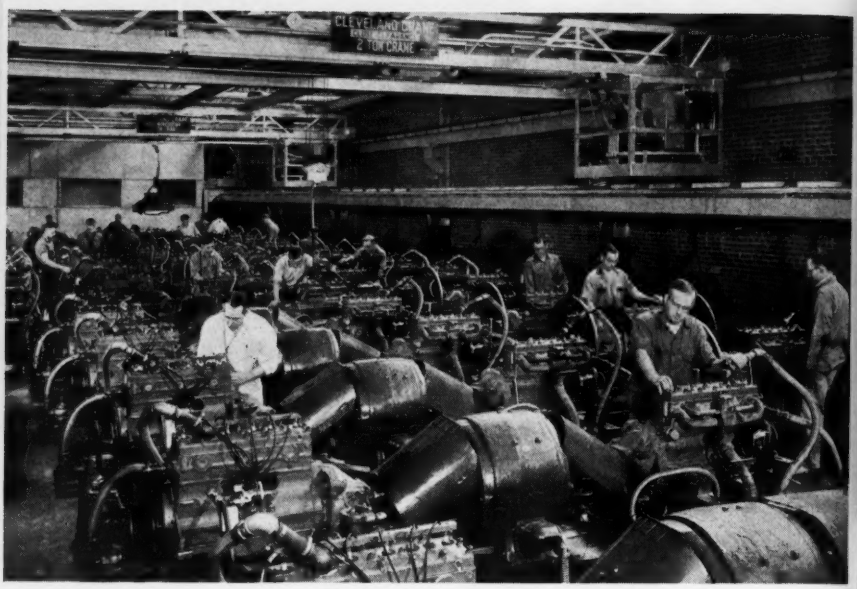


Fig. 23—View of test room, in which 117 engines can be under test simultaneously.

six-volt motor generator sets. The entire system is interlocked electrically so that any drop in either water or oil pressure will automatically shut off all engines and dynamometers.

Water for engine testing is cooled in four banks of coils in the basement, the water being maintained at a constant temperature of 160 deg. F. by varying the amount of air drawn through the coils. Air for cooling the coils and also for ventilating the testing room above is drawn by two large fans driven by a 125 h.p. motor. The air in the testing room is completely changed every minute.

The power conveyor upon which the finished engines are carried from the test department transports them to the loading dock where they are loaded into freight cars or trucks for transportation to other International plants where they are assembled into the finished product.

COMET MILLED FILES

The files with the WAVE CUT. For better and faster work.

Chip Breakers arranged wave like, no clogging, chips curl between teeth and are thrown out sideways by succeeding chips. Smooth and uniform surfaces.

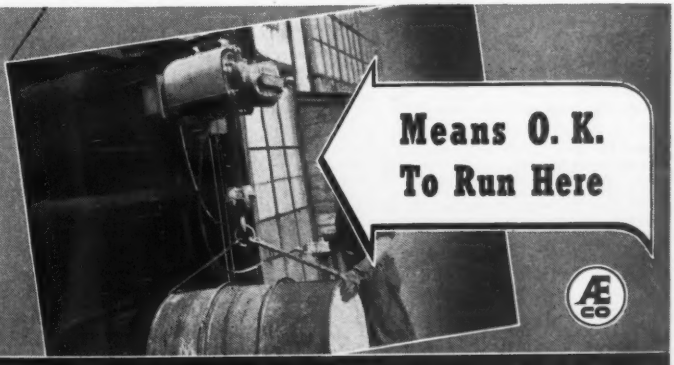
For Economy Performance, Efficiency

A Comet Milled File outlasts any ordinary File at least five times.

COMET TOOLS, INC., 39 Union Sq., New York, N. Y.

The ideal files for all industries. Write for Catalog. Agents and Dealers wanted.

Choose THE hoist which will run on standard I-beams or tracks of any make. Ask the nearest A-E-CO representative* to tell you how easily Lo-Hed Hoists can be adapted to run on your track system. Ask him to explain Lo-Hed's exclusive features that give you fast, dependable operation with minimum maintenance cost. Let him show you Lo-Hed's uses in scores of industries. Find out *why* Lo-Hed is the logical hoist for EVERY purpose and why it is the *only* hoist for low headroom conditions. A-E-CO Lo-Hed Hoists are built in many standard models, from ¼ to 12 ton capacities.



*Classified phone directories list the local A-E-CO representative in principal cities. Call him in . . or write us for the new hoist catalog.

Other A-E-CO Products: Taylor Stoker Units Marine Deck Auxiliaries Hele-Shaw Fluid Power.

A-E-CO Lo-Hed HOISTS

AMERICAN ENGINEERING COMPANY

2451 ARAMINGO AVENUE. PHILADELPHIA. PA.

THE LINCOLN ELECTRIC CO.

MANUFACTURERS OF

"Linc-Weld" MOTORS—"Shield-Arc" WELDERS

OFFICES IN ALL PRINCIPAL CITIES

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P O BOX 5728

CLEVELAND, O. December 9, 1938

Mr. Howard Campbell, Editor,
Modern Machine Shop,
431 Main St.,
Cincinnati, Ohio.

In reply refer to J.F.Lincoln

Subject

My dear Mr.Campbell:-

Under the attack on business by the present administration we manufacturers like to feel that we are martyrs. We know the attack in unjustified, in general. Government, however, has uncovered some abuses which are real enough to justify action in some cases.

One of these abuses which as yet has not been the subject of regulation but which will and perhaps should be, is that of reciprocal buying. This exploded theory is continued only because of its age, not because anyone in industry finds it a satisfactory method of placing business.

Industry, at great expense, sets up a purchasing department, an inspection department and an engineering department, to produce material of proper price and quality. After having done this they put in a reciprocal relations department who override the decisions of the buyer, the inspector and the engineer, and place business merely because of the suppliers' results in frequent strained industrial relations since no one can buy in a volume to satisfy the reciprocator. Not only that, but the distribution is never fair from the seller's point of view.

Reciprocal buying results in higher prices since the reciprocator cannot get the best price available. It results in lower quality since the reciprocator cannot insist on quality. It results in lack of standardization which enormously increases cost of upkeep.

I can see the joy with which a La Follette, or a Roosevelt, or other muckrakers, will pounce on this industrial foible to show how incompetent is the management of American business. With that proof the New Deal can show it is necessary for government to guide, direct and protect industry, and thus only can it be kept solvent. As a matter of fact, who can show that government is not right in such conclusions? Result: One law, a million new jobs and a billion new taxes.

The worst of it is that in this case the government would have a perfectly clear case to prove its point. No one could take the untenable position that reciprocal buying is anything but asinine and wasteful. However, in the hands of governmental regulation for its elimination, a waste will be turned into regimentation from which industry perhaps can never recover.

Yours very truly,

J. F. Lincoln

JFL-LL

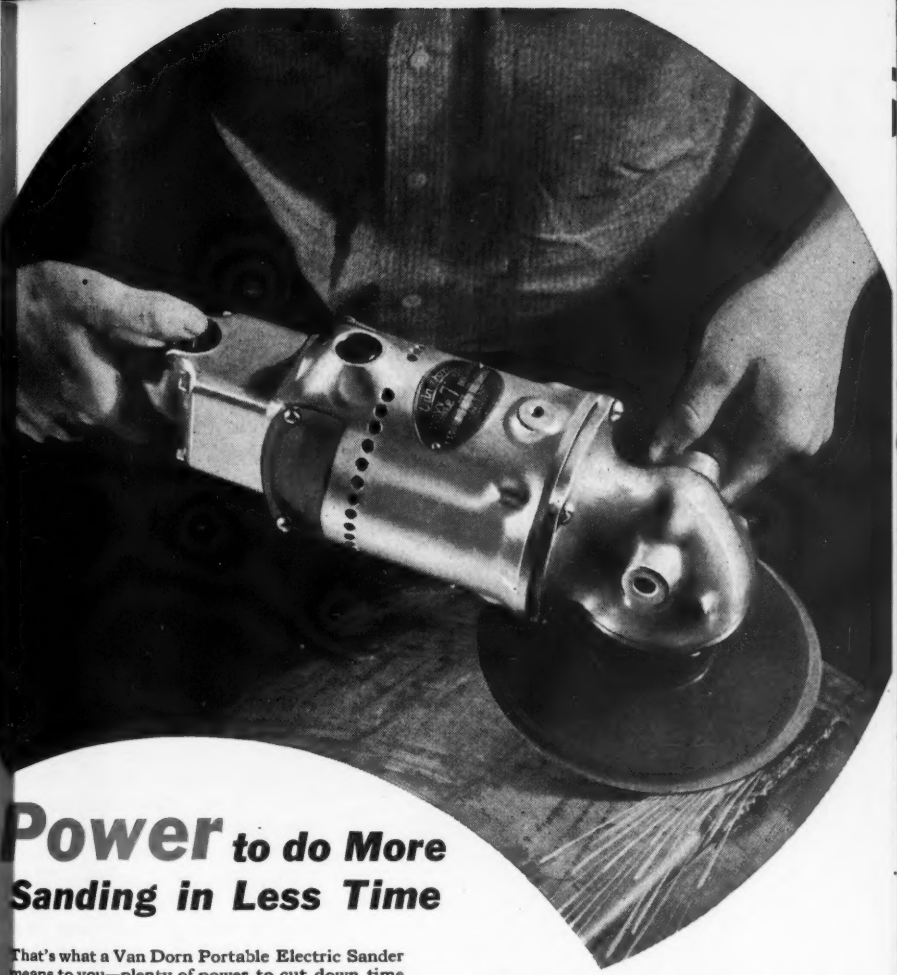
Danger!

In no way can human intelligence better be expressed than through the medium of co-operation and team-work. But when that idea is expanded to a point that forces the acceptance of inferior or unsuitable merchandise at perhaps unsuitable prices in order to aid the sales department, it ceases to be co-operation — as Mr. J. F. Lincoln points out in the accompanying letter.

Profits are made through sales, true enough, but sales are based on competitive prices which, in turn, are made possible through the use of good materials and modern equipment. And equipment and materials purchased on a reciprocal basis are often too unsuitable, resulting in increased costs or an inferior product.

In addition, Mr. Lincoln points out that the inefficient, unintelligent method of transacting business on a reciprocal basis may lead to more serious consequences.

In denouncing the evils and pointing out the possible consequences of this obnoxious practice, Mr. Lincoln is openly championing the cause of many who have refrained from expressing themselves on this subject heretofore. We know that Mr. Lincoln would be glad to hear from those who are in accord with his views.



Power to do More Sanding in Less Time

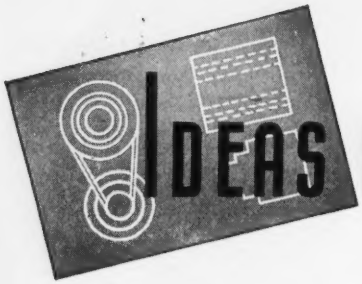
That's what a Van Dorn Portable Electric Sander means to you—plenty of power to cut down time and costs on countless surfacing jobs. Gone forever are slow, laborious hand filing, sanding, chipping with one of these handy, versatile Sanders on the job—for they quickly remove paint, scale and rust; smooth welding and casting ridges; wire-brush, polish and buff metal and other surfaces; and handle numerous metal-finishing jobs better and at less cost.

The 7-inch Heavy Duty (illustrated) together with the 7" Special, 7" Junior, 9" Standard and the 2-speed, Dual-Purpose 7"-9" Combination Sander comprise a complete, well-rounded Sander line—*one* of which is *bound* to fill your particular requirements.

See this famous Van Dorn Sander line at your Jobber's—or write for details and catalog to The Van Dorn Electric Tool Co., 720 Joppa Road, Towson, Maryland. (Div. of Black & Decker Mfg. Co.)

"Van Dorn"

THE "RED HEADED" PORTABLE ELECTRIC TOOLS

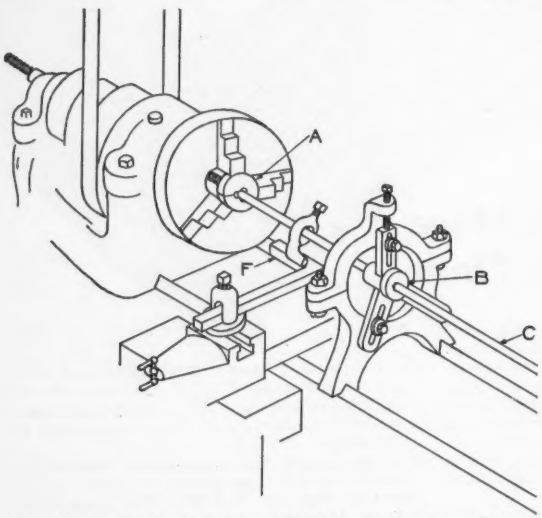


IDEAS FROM READERS

Threading Six-Foot Bars Full Length

By CHAS. H. WILLEY

AN ORDER which recently came into the machine shop called for twenty bars of brass, each six feet long, to be threaded their full lengths with a ⅝-in. No. 24 thread. As there were no bolt threading machines available, it became necessary to perform the threading operation in an engine lathe. The drawing illustrates the method used to thread the bar



Drawing Showing Equipment Used to Thread Long Bars Full Length

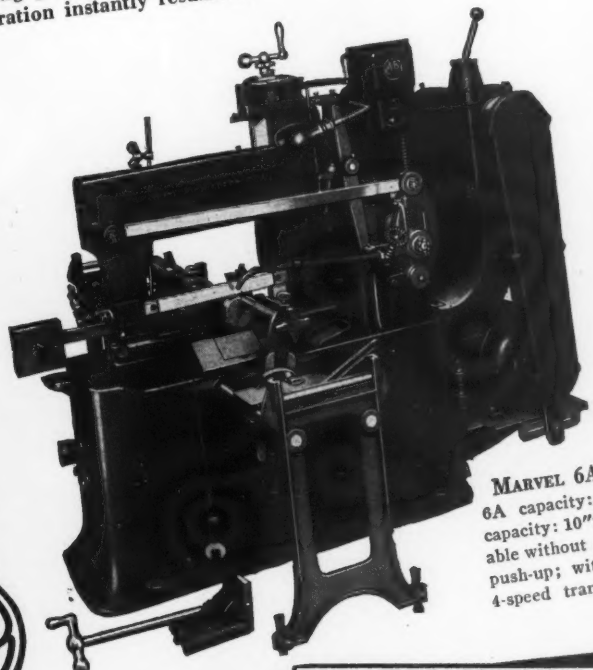
A ⅝-in. round die **A** was clamped in the lathe chuck and a bushing bored to a sliding fit for the ⅝-in bars, was chucked in the steadyrest in direct line with the die **A**. The end of each rod, one of which is indicated at **C**, was chamfered and the rod was then inserted through the bushing to be fed through the die **A**. Before starting it into the die, however, a lathe dog was slipped onto the bar and clamped with the tail of the dog resting on an L-shaped bar **F** which, in turn, was clamped on the toolpost as shown in the illustration to prevent the bar from turning. This done, the lathe was started and the bar was fed into the die by hand.

Cutting oil was applied to the bar as it was fed into the die and the centrifugal action of the die caused the chips to be thrown outward, thus clearing the die as it cut. When the tail of the dog reached the end of the bar **F**, it was moved back as far as possible on the bar and re-clamped. As the end of the rod cleared the steady-rest, a larger dog and split nut were clamped to the threaded end so that the operator

MARVEL SAWS AND BLADES

You're probably paying too much for cutting off identical pieces from bar stock . . . unless, of course, you have at least one or more new heavy-duty super high speed MARVEL Automatic Production Hack Saws. No other machine of comparable accuracy can cut off an equal number of pieces from bar stock up to 9" diameter with such speed and with such low labor, power and tool cost, and with so little chip loss! Much heavier and all-ball-bearing, with automatic bar push-up, MARVEL Automatic Saws are built for continuous operation at speeds, feeds and blade tensions *absolutely impractical* for any other make of saw! They cut squarely, accurately . . . save stock and machining . . . and they're *fully automatic — all the way!*

MARVEL Automatics are also Multi-purpose; they'll handle all run-of-the-shop sawing easily and efficiently. The bar push-up can be disengaged at any point, miscellaneous cuts made, and automatic operation instantly resumed.



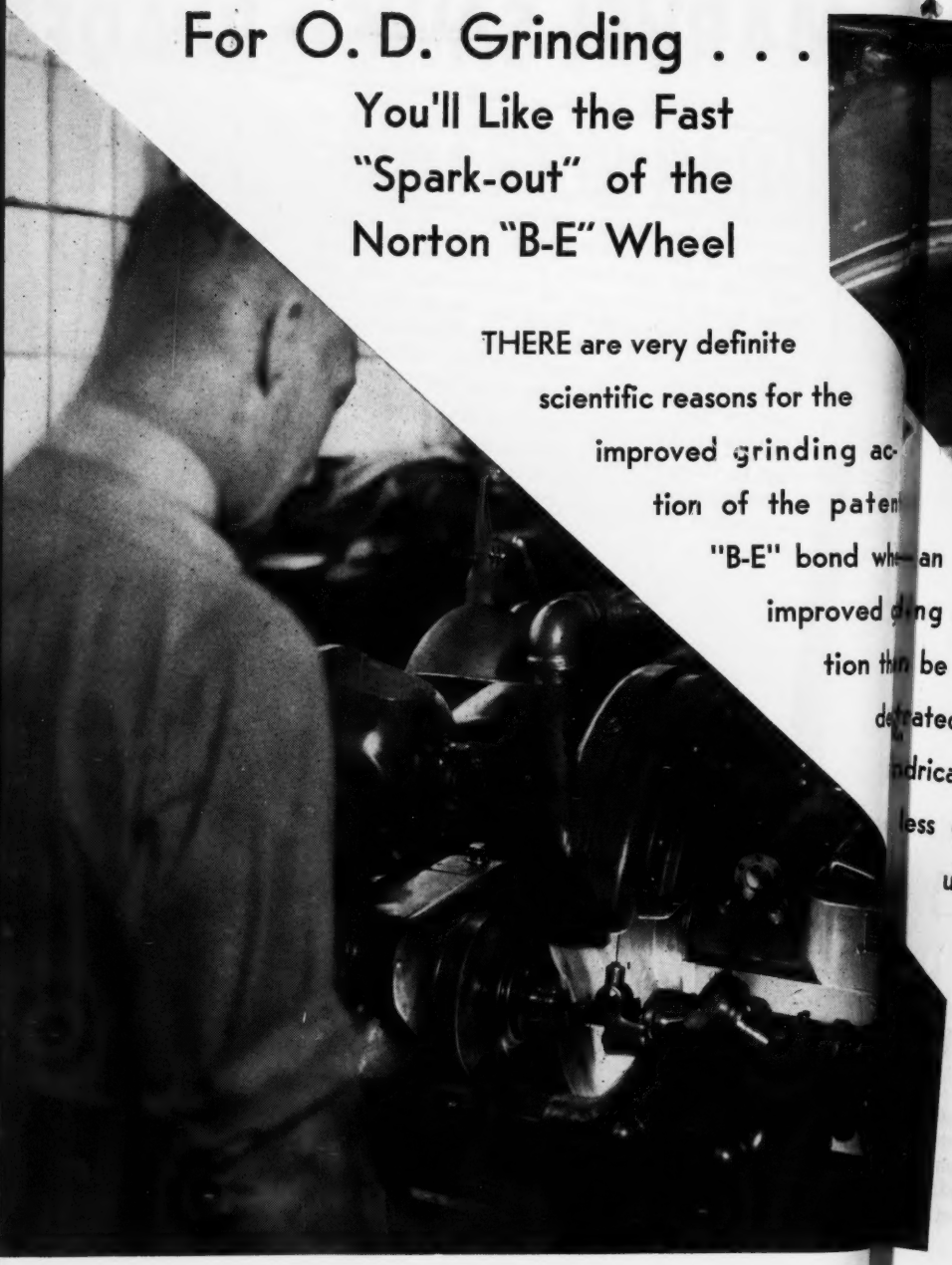
MARVEL 6A AND 9A
6A capacity: 6"x6"; 9A capacity: 10"x10". Available without automatic bar push-up; with or without 4-speed transmission.

MARVEL

ARMSTRONG-BLUM MFG. CO.
"The Hack Saw People"
5745 Bloomingdale Ave., Chicago, U. S. A.
Eastern Sales: 199 Lafayette St., N. Y.

For O. D. Grinding . . .

You'll Like the Fast "Spark-out" of the Norton "B-E" Wheel



THERE are very definite scientific reasons for the improved grinding ac- tion of the paten "B-E" bond wh— an improved g—ng tion th— be de—rated —drica— less u—

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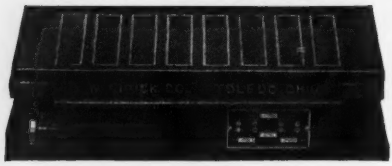
Best Values on the Market



Working Surface 5¾" wide, 13" long.
Consumes .5 Amp.

L-W MAGNETIC CHUCKS

Waterproof for wet or dry grinding

A REAL MAGNETIC CHUCK that is adaptable for any purpose. Unconditionally guaranteed to furnish the highest magnetic holding power on either 110 or 220 volt direct current. Well designed and beautifully finished, highest quality workmanship throughout—complete with cord and plug—an outstanding value..... **39.75**

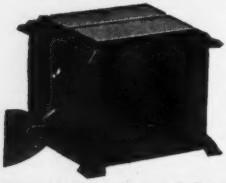
Also made in the following sizes: 6½x18"—$53.50. 8x24"—$95.00. 10¾x37"—$175.00.

NEW-IMPROVED DEMAGNETIZERS

Model B-2

59.50

Complete with pilot light signal, switch and cord. Operates on 110 volt A.C. current. 7¾" wide, 12½" long, 6¾" high. Shipping wt. 55 lbs.



Model J-1

41.00

Complete with switch and cord ready for use. Operates on 110 volt A. C. current. 7¼" wide, 7¼" long. 6¾" high. Shipping weight 35 lbs.

To meet the demand for a Demagnetizer that would properly fill the requirements of taking the magnetism out of work that has become demagnetized through induction, we have designed and built two models for large and small work. A single pass over the stationary poles is sufficient to demagnetize the work completely.

L-W also manufacturers Power Saws, Lathe Chucks, Milling Machine Vises and Dividing Heads

Send for catalog of the complete L-W Line

L-W CHUCK CO.

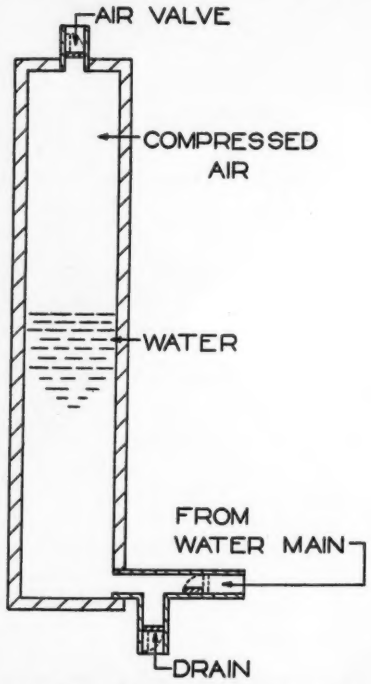
20 N. ST. CLAIR ST. TOLEDO, OHIO

could grasp it with his hands and keep the rod from revolving until it was completely threaded.

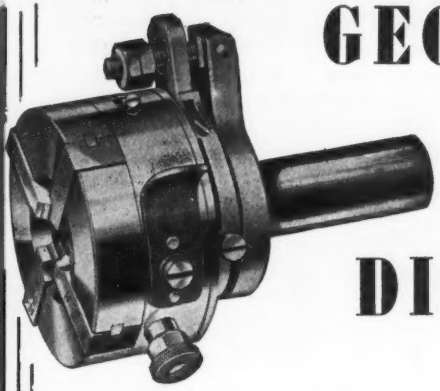
An Air Compressor Kink for the Machinist

By W. F. SCHAPHORST

THE drawing illustrates a method by which a machinst can utilize water pressure to compress air without the use of a pump or other equipment excepting, of course, a pressure container for the air. The tank should have an air valve at the top, and a water inlet and drain at the bottom, as shown in the illustration.



Drawing Illustrating Method of Utilizing City Water Pressure to Compress Air Without the Use of a Pump



GEOMETRIC STYLE DS DIE HEADS

Designed especially for Brown & Sharpe Automatics, but suitable for hand machines as well, the Geometric Style DS Die Head is a precision tool for accurate and economical screw threading. The buffer action shank allows the tool to yield as it starts on the thread, insuring a smooth, uniform engagement of the chasers without shaving. The adjustable trip mechanism is unusually sensitive, eliminating the possibility of stripping threads. It may be set to cut an accurate length of thread, so that close camming is unnecessary. On B. & S. Automatics the head may be closed automatically by a stop on the bed of the machine, contacting the closing attachment.

Like other Geometrics, this tool is hardened and ground throughout, built to close limits, carefully tested and inspected. The Style DS Die Head will cut smooth, accurate screw threads on your work — and save you money. May we send you our booklet?

THE GEOMETRIC TOOL CO.

NEW HAVEN, CONN.

To compress the air, the valve at the top and the drain at the bottom should be closed, then water from the city main should be allowed to enter through the inlet at the bottom. As the water enters the tank at the bottom, it compresses air in the top of the tank. When the pressure of the trapped air equals that of the water in the city main, the inflow of water will cease.

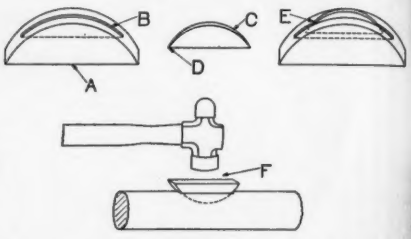
The compressed air can then be used for small jobs of paint spraying, filling automobile and bicycle tires, dusting, starting diesel engines, and so on. When the water has filled the tank, it can be drained out and the process repeated.

Anchoring a Woodruff Key

By A. H. WAYCHOFF

OCCASIONALLY Woodruff keyways on shafting become so loose and worn that difficulty is experienced in keeping the Woodruff keys in place while positioning a pulley or pinion on the shaft. Illustrated in the drawing is a method by which this annoyance may be overcome.

Using a thin hacksaw blade, a slot is sawed lengthwise of the key at the center of the curved side as shown at **B.** Then a thin wedge is made, tapered to almost a knife edge on the straight side as shown at **D.** Before the key is positioned in its seat, the wedge is tapped lightly into the slot in the key as shown at **E,** then the key is placed in its seat and driven down with a hammer. As the key is



Drawing showing How a Woodruff Key Can Be Anchored in a Worn Seat

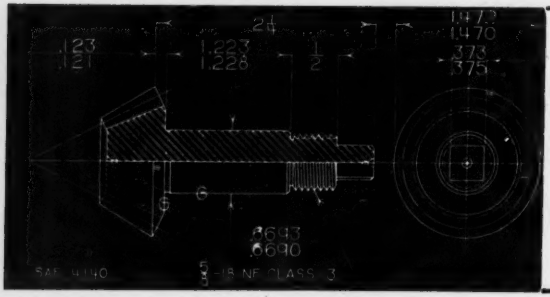
forced down, the wedge forces the sides apart at the bottom, anchoring the key solidly in position.

Wood Wedge Prevents Chatter

By A. H. WAYCHOFF

EVERY experienced machinist knows that, when taking a cut on long work in the lathe, especially if the work is slender and the cut fairly heavy, a certain amount of "chatter" may be set up which will usually result in anything but a smooth job.

One of the best methods of elimi-



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An example of the close tolerances held by Crofoot is shown in this bevel gear shaft drawing. Send blueprints for estimates.
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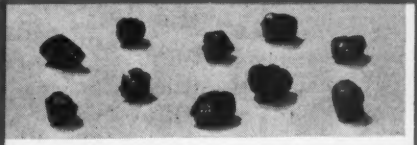

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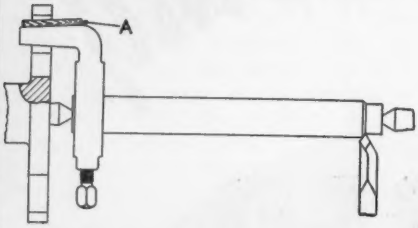
nating this chatter is to simply drive a wood wedge into the slot in the faceplate between the dogtail and the



Drawing Illustrating Use of Wood Wedge to Eliminate Chatter in Turning Long Work

side of the slot. The wood usually provides the necessary resiliency so that a smooth cut is obtained.

"Machinist's Practical Guide" is the title of a handy vest-pocket book now being distributed by Morse Twist Drill & Machine Co., New Bedford, Mass. The book contains 55 pages of helpful information on drill grinding, cutting speeds, decimal equivalents, lubricants for cutting tools, and so on. Copy free to any mechanical executive who will address a request on his company letterhead.

Ex-Cell-O Center Lapping Machine is the subject of a four-page illustrated folder issued by Ex-Cell-O Corporation, 1206 Oakman Blvd., Detroit, Mich. The features and advantages of the machine are discussed and specifications are given. Ask for Bulletin No. 10782.

Starrett Catalog No. 26. The twenty-sixth edition of the Starrett catalog released by The L. S. Starrett Company, Athol, Mass., contains complete descriptions and prices of the more than 3,000 improved tools and standard items in the Starrett line.

The 282 pages of the book are arranged for ready reference with a quick-finding index to the various sections devoted to tapes, rules, micrometers, verniers, dial indicators, gages, calipers, hacksaws, and so on. In addition, the book contains many photographic illustrations showing how precision tools are used in modern industrial plants. Copies of the catalog may be obtained by writing to The L. S. Starrett Company.

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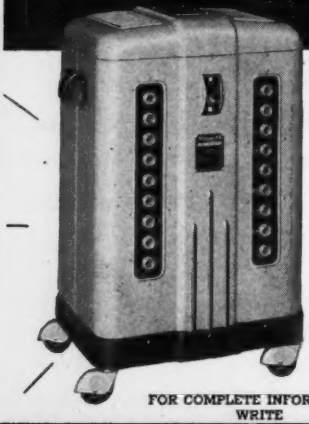

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MOLY

AS WE cross the threshold of a New Year, most of us pause a moment to wonder what the next twelve months will bring. With great nations turning gangster and adding to their domains at the point of the bayonet, with our own country beginning to stagger under an ever-mounting debt, with industrial discord hampering the return of peace and prosperity, a pessimistic attitude toward the future seems unavoidable.

We should be less than fair to ourselves, however, if we failed to balance the disadvantages of the present age against those of by-gone days. We are prone to forget that, although the history of civilization extends back some 6,000 years, most of the advantages to which the majority of us are accustomed are less than a century old and many of the most important ones have come into being within the life-time of men who are yet in their prime.

Up to a century and a half ago the wind-mill and water-wheel were still the principal sources of power. A century ago steam was coming into its own, making man independent of the winds and flowing streams. It was just about a half-century ago that the electric generator and motor were developed, making possible the subjugation of Nature's own force—electricity—and the transmission and application of power, heat, light, and sound not only through inert strands of wire, but through the very air itself.

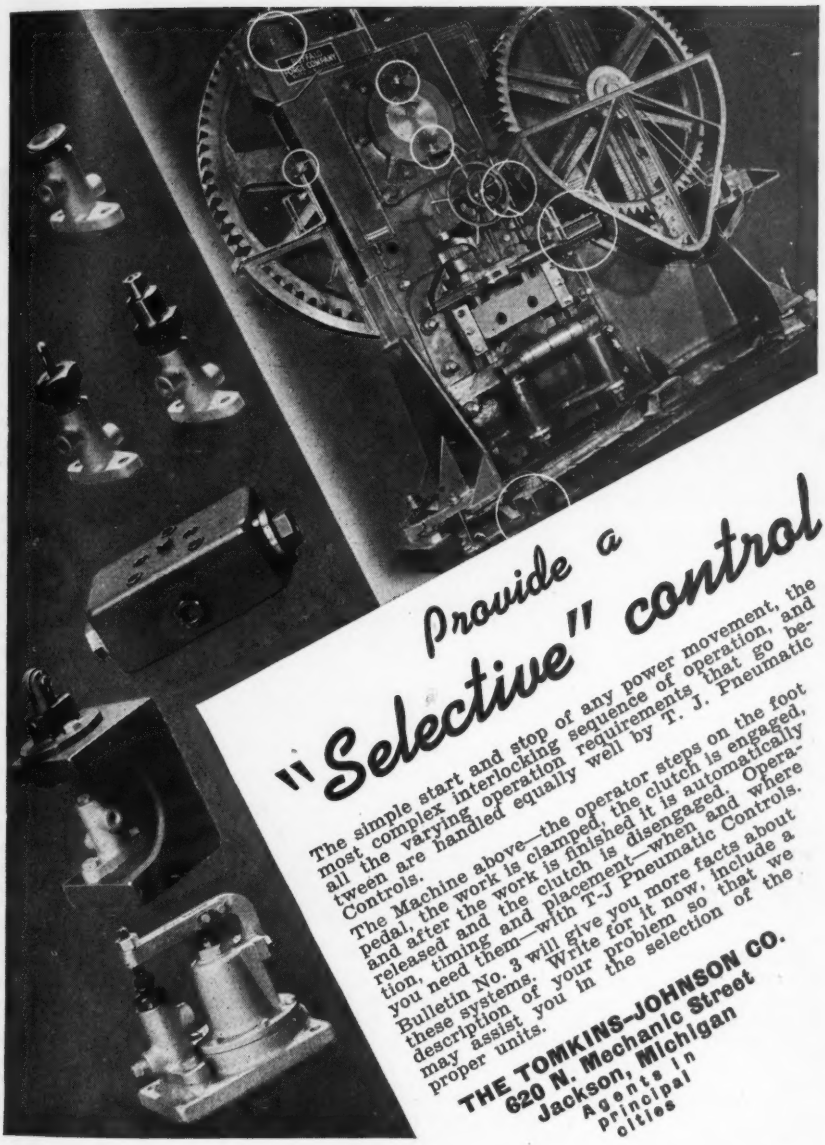
Today we bend this force to our will, making it run our manufacturing plants, operate our machines, drive our street cars, and perform a multitude of otherwise laborious tasks. The ancient broom, in use until less than thirty-five years ago, has been replaced by an electrically-operated machine which collects dust and dirt almost without effort. Fifty years ago the only ice to be had was what could be gathered from frozen lakes and streams; today any home within the reach of electric current can have its own ice plant and cold storage receptacle.

Fifty years ago transportation was confined to the railroads, to navigable streams, and — so far as individual conveyance was concerned — to the horse-drawn vehicle. Today man can travel wherever there is a fair road in a car that is mechanically-operated and is comfortably cushioned, heated and lighted. Twenty-five years ago the only roads, outside of the cities' paved streets, were of the ancient dirt variety; today the nation is crossed and recrossed by ribbons of smooth pavement upon which one can travel in comfort at high speeds.

A century ago the work-week usually consisted of 84 hours; fifty years ago it was 60 hours; today the average is from 40 to 44 hours, giving the worker ample time for leisure and recreation and making it possible for him to enjoy the conveniences that have been developed for his use.

Last but not least, let us not forget that today's problems are but temporary; solutions will ultimately be found for all of them. They always are. And when that time comes, and we emerge from the fog of difficulties that beset us at the moment, we will find that we have advanced a step nearer to the goal of peace and plenty for all. So —

Happy New Year.



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The simple start and stop of any power movement, the most complex interlocking sequence of operation, and all the varying operation requirements that go between are handled equally well by T. J. Pneumatic Controls.

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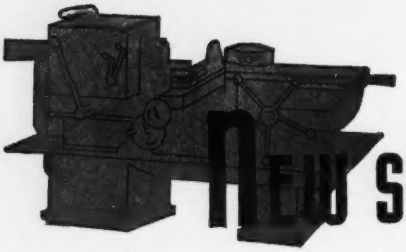
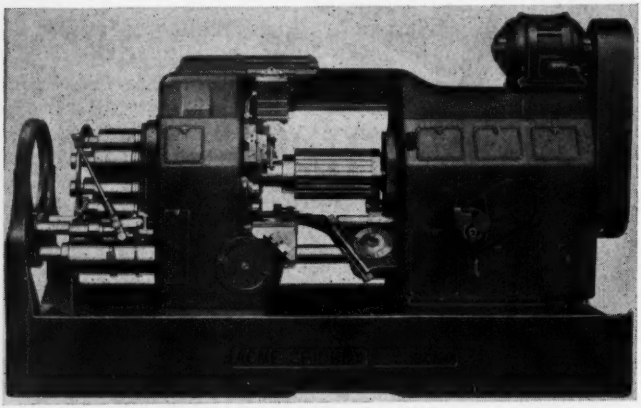


NEW SHOP EQUIPMENT

Model RA-8 Eight-Spindle Acme-Gridley Automatic Bar Machine

To the line of four and six-spindle Acme-Gridley automatic machines marketed by The National Acme Company, 170 E. 131st St., Cleveland, Ohio, has been added the new Model RA-8 Eight-Spindle Acme-Gridley Automatic Bar Machine shown in the illustration, designed for use on those classes of production where the availability of eight spindles will result in production economy.



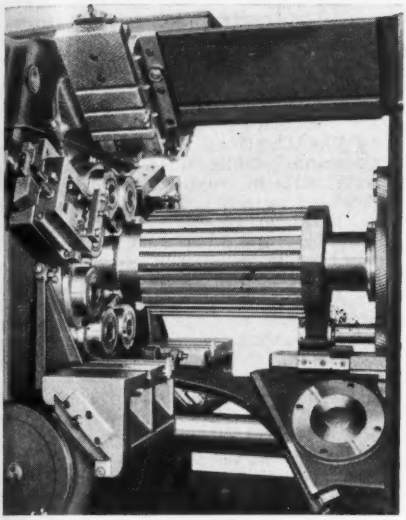
Model RA-8 Eight-Spindle Acme-Gridley Automatic Bar Machine

The frame is built up of four high-grade alloy castings including a heavily ribbed pan, headstock and gear box cross-walled and with reinforced shaft bosses, and a rigid one-piece top brace, all doweled and bolted to form a unit. The design retains essentially the same spindle carrier and tool slide design which have for years been used in the four and six-spindle automatics.

The precision ground spindles a mounted in anti-friction bearings. Th end tool slide, which is of forged stee is provided with bushings closely fitte to the carrier stem and protected by front wiper. The slide is further su ported by a rugged guide arm whi travels on the heavy guide plate belo the carrier stem.

All six side slides move on harden steel ways havi adjustable gib All cam and r contacts to slid are short, resu ing in powerf direct tool actio The lower sid slides are mount on heavy bases a at an angle, su ported low a well back into t frame witho overhang. Th design provi the advantages the shortest po ble leverage tween drum, c and roll contact the center of slides, finer ac racy, more c clearance, and greater operating c venience. The side slides operate tirely independent of each other.

The two upper side slides are moun on the heavy top brace. Each slide independently controlled from its h zontal drum, driven through gears a a vertical shaft from the lower cr slide drum shaft. This rigid constr tion facilitates the application of he tool holders in the two top spindle po tions. Provision is made for the mo ing of two centrally located side sli on the face of the headstock hou adjacent to the third and sixth positi



View Showing Tool Slides of Acme-Gridley Model RA-8 Multiple Spindle Automatic

these slides to be independently controlled by vertically mounted cam drums driven from the main drum shaft.

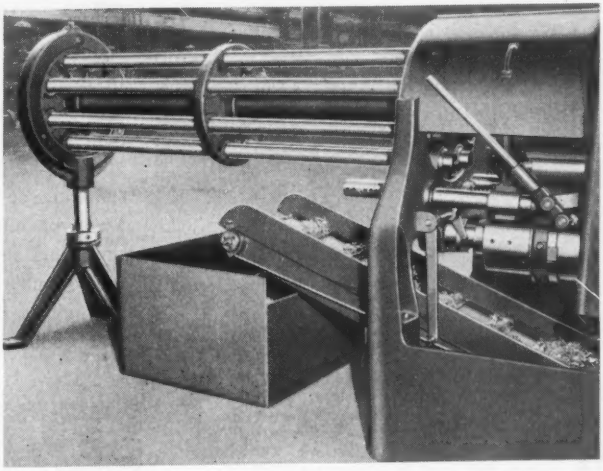
Starting from a standstill, the spindle carrier is indexed by a modified Geneva mechanism which rapidly accelerates and then decelerates, bringing the movement to a dead stop without shock before the locking pin is engaged. The entire indexing mechanism is completely enclosed in the headstock. The front disc of the stock reel turns in a reel guide mounted directly on the end of the pan, and is itself independently power-indexed through a separate shaft and gear, eliminating torsional strain.

Chucking shoes have wide bearing surfaces on chucking spools. A hand chucking mechanism permits the removal of butt ends when restocking the machine. Cams for operating the chucking and feeding mechanism are conveniently arranged for quick changes. The new stock feed stop is rack-and-gear-operated direct from the main drum shaft.

The change gear system is simplified, a perfected braking mechanism combined with large disc and roller clutches being housed within the gear box section. All interchangeable feed change gears and speed change gears are mounted at the motor end of the machine and are quickly accessible by removing a cover. A wide range of high and low spindle speeds and fine to coarse feeds are available. Power is supplied by a motor through V-belt or silent chain.

Due to the increased number of working positions available, provision is made for the mounting and driving of a wide variety of standard and special attachments such as threading and tapping attachments or attachments which accelerate reaming or turning operations. These slides are operated by separate cams by a drum located on the main drum shaft. High speed drilling attachments can be used in all eight spindle positions. Taper turning or combined taper turning and taper boring attachments can be applied to any of the six side slides and attachments for specialized operations include slotting, knurling, burnishing, and so on.

All gears that operate at high speeds



Rear End View of Model RA-8 Acme-Gridley Machine, Showing Chip Conveyor

are of the helical type, providing the maximum strength of gear tooth for a given width of face, and all cams are alloy steel. A constant flood of clean filtered oil is provided to every moving part of the machine.

The open and widely arched spindle end of the machine provides for easy installation of the standard chip conveyor, which is bolted to the rear end of the pan. Guides direct the chips to the bed of the conveyor where cross blades attached to an endless chain on each side sweep the chips up an incline into the container. The conveyor is driven from a cam drum on the end of the main drum shaft. The entire conveyor may quickly be removed. All moving parts of the machine are safely guarded, and hinged and sliding splash guards confine coolant to the tooling zone.

The Model RA-8 is available in two capacities; 2¼ in. and 2⅝ in. The maximum length of stock feed is 10 in., and of turning, 8 in. Spindle speeds, minimum 101 r.p.m., maximum 1,160 r.p.m. Motor horsepower, 25. Floor space, including stock reel, 21 ft. 8⅞ in. x 4 ft. 8 in. Net weights, belt drive, 28,975 and 30,525 lbs.; motor drive, 29,550 and 31,000 pounds.

"American" 11-In. Column 5 H.P. Hole Wizard

The "American" Hole Wizard Radial Drill illustrated is the latest addition to the "American" Hole Wizard line built by The American Tool Works Company, Cincinnati, Ohio. This machine is built with a 11-in. diameter column and is powered by a 5 h.p. built-in high reversal ball bearing motor. Available in arm lengths from 3 to 6 ft. inclusive, the machine is calculated to cover a wide range of drilling, tapping and boring. Convenience of controls and ease of operation are emphasized in this design, while 12 spindle speeds, up to 3,000 r.p.m. maximum, are available for high speed operations.

The manufacturer claims for this new machine not only maximum speed and economy in performing conventional drilling and tapping operations, but a remarkable aptitude for accurate boring and spot facing operations frequently encountered in tool and die work.

The drive to the spindle is by means of hardened and ground helical gears, providing smooth power transmission and a very quiet drive even at high

Faster Handling Can Cut Your Costs, *Too*

In this West Coast plant, speed and convenience in handling parts during both manufacturing and assembly operations have been increased by his installation of *Stackbins*. At machines, *Stackbins* eliminate waste hand motions, and so step up production. At the assembly bench, parts are visible and within easy reach—the time-per-unit-produced has been lowered.

You can make similar savings by the use of patented STACKBINS—individual or sectional stacking bins of heavy gauge steel with full-width hopper fronts. Write today for our suggestions. Stackbin Corp., 53 Troy St., Providence, R. I.

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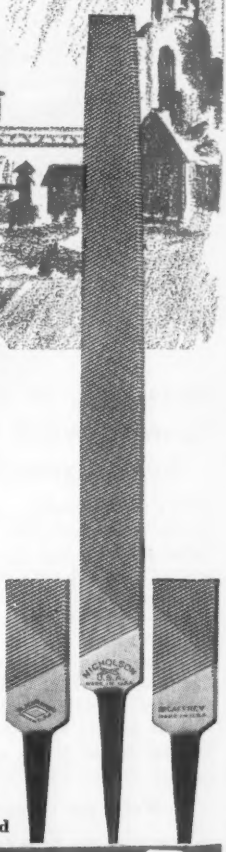
The file, because of its wide usefulness, demanded volume production. Then, in the early sixties, word came from Providence, "Quality files are being produced by machine!" And the quality of Nicholson Files was echoed and re-echoed, for only fourteen years after its founding, this company supplied a volume double that of the entire import of foreign files into this country!

Ever since this company pioneered, the quality of its products has been maintained to the standards which are demanded of the world's file leader. Nicholson File Company, Providence, R. I., U. S. A. Canadian Plant, Port Hope, Ontario.



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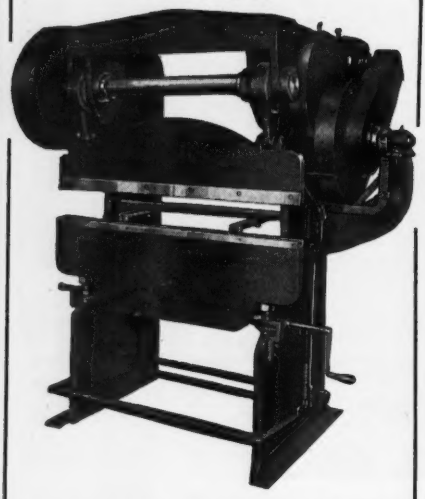

does 40% to 60% of the forming work turned out by the average shop.

Here's a profitable, economical brake ideally adapted for rapidly forming metal sections such as in stoves, refrigerators, soda fountains, steel cabinets, metal furniture, steel boxes, and a great variety of sheet metal specialties. Its variable speed drive operates from 17 to 50 strokes per minute. The No. 253 CHICAGO STEEL PRESS is accurate, compact, and ruggedly constructed of highest quality materials.

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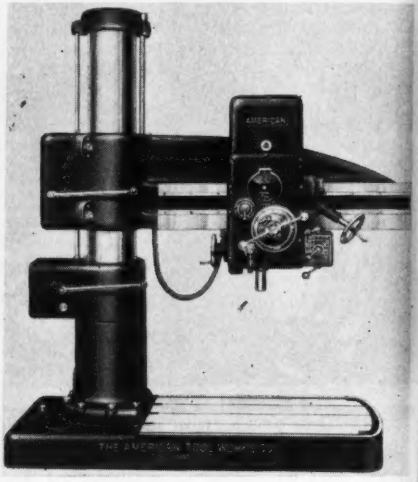
spindle speeds. The spindle and sleeve are of Nitralloy steel nitrided for extreme surface hardness. The spindle is ground to very close limits and the sleeve is honed to precision limits. These units are hardened and thus are practically impervious to wear. The hardening and grinding of these parts permits a close fit between the two, resulting in a precision mounting that lends itself to most accurate drilling and boring for



"American" 11-in. Column 5 H.P. Hole Wizard

tool room operations, die making and jig boring.

The driving sleeve is mounted on Timken precision bearings at top and bottom with means for take-up in case of wear. This construction ensures not only friction-free drive, but also maintenance of original accuracy.

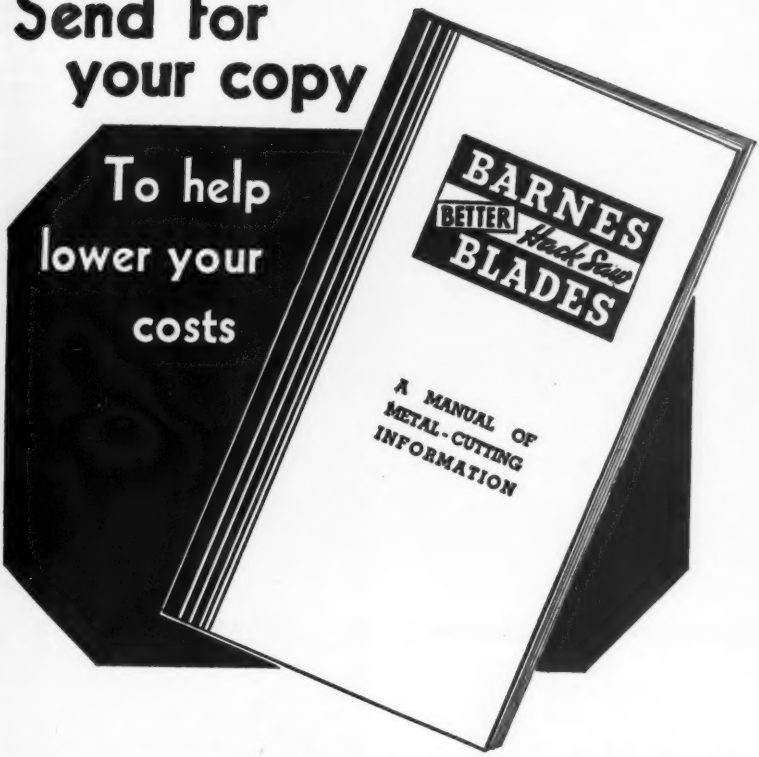
Springfield "High-Grade" Metric System Tool Room Lathe

The Springfield Machine Tool Company, Springfield, Ohio, has brought out a "High-Grade" Tool Room Lathe equipped with ball bearing geared head designed to provide 12 changes of speed. The spindle runs in precision taper roller bearings.

The feature of this tool is that it is a complete metric system lathe. The lead screw and all measuring screws are de-

Send for your copy

To help lower your costs



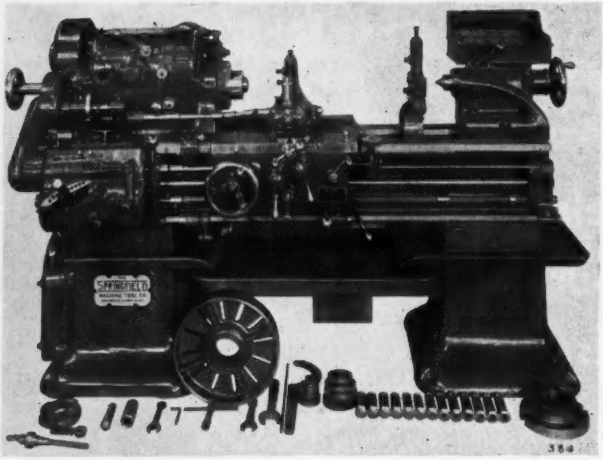
The Barnes Manual deals with the Hows, Whys and Wherefores of hack saw blades and band saws. Now in its third edition and literally filled with *definite* and helpful information, it's a book you should always have within easy arm's reach.

Of course, we make hack saw blades and band saws and you can't blame us for putting in a few pages devoted to the metal cutting performance which each delivers.

Ask your distributor for a copy of this 32-page Manual or write to us direct.

No Charge!

W. O. BARNES CO., INC., Detroit, Mich.



Springfield "High-Grade" Metric System Tool Room Lathe

signed for metric measurements. The machine itself is equipped for full tool room purposes, including a relieving attachment, taper attachment, draw-in collet attachment, oil pan and other regular equipment. T
design includes
unique thread ch
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the proper time
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to produce any of t
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A large dial simil
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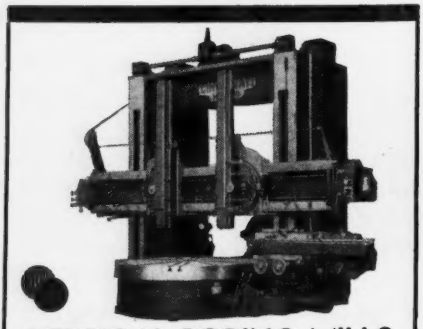
each column of threads as indicated
the index plate, and full instructio
are given on the data sheet showi



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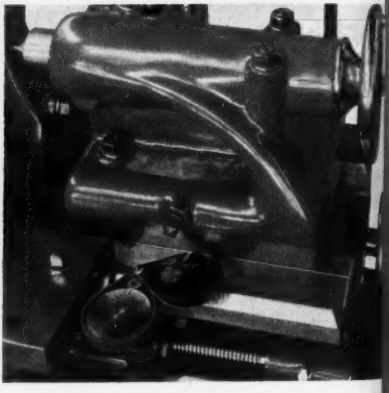


Thread Chasing Dial on Springfield Lathe

how to use each dial. The mechani
can be dropped out of engagement wh
not in use.

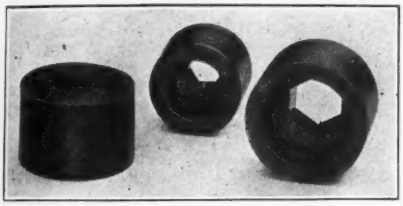
Elmes Hydraulic Bending Brak

The illustration shows a bending a
forming brake now being introduced

Tips ON TOOL HEAT TREATMENT

The Picture Has Changed

Last month we talked about the importance of slow and thorough preheating of tools and dies and how distortion or warpage can be minimized by careful preheating. The new atmosphere furnaces have made it possible for the hardener to thoroughly soak his work without fear of surface damage.



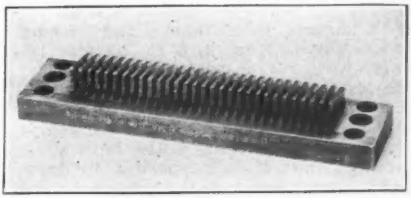
Trimmer dies of High Speed Steel which have been Hydryzed. Edges are sharp and hard as they must be for this service.

Before modern equipment was available the hardener usually had two courses to choose from in heating his tools or dies. He could carry an oxidizing atmosphere, which tended to scale the work—or a reducing atmosphere, which might or might not decarburize it. The scale due to an oxidizing atmosphere was usually "thrown" in the quench—but pitting and loss of dimension occurred and on closely machined work this was serious. If, on the other hand, the surface had a soft "skin," the "skin" had to be removed by stoning and polishing.

The tendency therefore was to hurry the work through the higher heats in an endeavor to hold scaling and soft "skin" at a minimum. The tool or die was often not thoroughly heated—and trouble resulted.

The picture has completely changed with the introduction of the special atmosphere furnaces. Tools and dies can be brought up to heat slowly and given sufficient time to become saturated without fear of scaling or soft "skin." Lack of temperature uniformity throughout the piece—the greatest cause for distortion—is thus eliminated. The surface of the steel is brought out to the proper hardness without trace of scale or soft "skin."

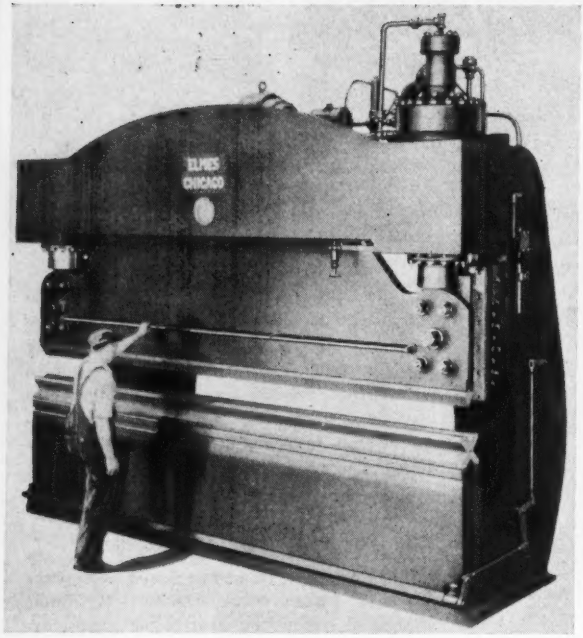
If you are having troubles with "skin," or scaling, send us several samples of your parts. We will harden them with our Hydryzing Process and show you what proper atmosphere will do for your own work.



An intricate punch like this requires full hardness on all surfaces—and must not be warped. Hydryzing increased its life 35% over previous heat treating methods.

Lindberg Engineering Co.
225 NORTH LAFLIN ST. CHICAGO

Lindberg Furnaces



Elmes Hydraulic Bending Brake

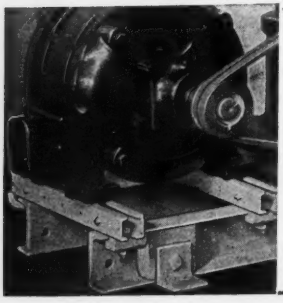
the Charles F. Elmes Engineering Works, 230 N. Morgan St., Chicago, Ill. The features of the brake are simplicity, high production, and safety. Hydraulically operated, the machine automatically by-passes the oil when an attempt is made to operate the brake beyond its capacity; thus it is impossible to damage the machine in this manner.

Screw adjustments are eliminated, since the bending beam continues its downward movement as long as the foot pedal is depressed, reversal of the pedal immediately reversing the movement of the bending beam travels to the work at a rapid advance speed, automatically slowing down for the actual operation. Movement of the beam can be held at any predetermined point by the operator while he checks his progress. The beam is returned under fast traverse. Pressure on the bending beam is equalized so that forming or bending can be done at any point on the bed. Speeds can be quickly adjusted within the limits of the machine. A unique safety feature makes it impossible to drop the bending beam when the motor is not in operation.

The depth of throat and opening are greater than usual in this type of machine. The bending beam is accurately guided on the welded steel housings by means of adjustable guides. Guides are pressure lubricated.

W. F. & John Barnes Horizontal Boring and Honing Machines

To meet the need for a machine capable of both boring and honing cylinders in a wide range of diameters and lengths, the W. F. & John Barnes Company, Rockford, Ill., has designed the



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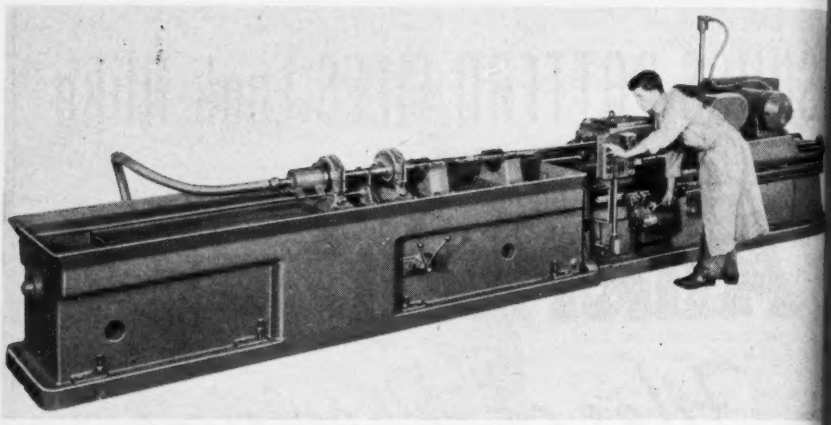

W. F. & John Barnes Horizontal Boring and Honing Machine

machine illustrated herewith. The machine is hydraulically operated, making available a wide combination of head feeds for boring or honing. The head, which is mounted on ball bearings, is designed to use Micromatic hydraulically controlled hones. The head housing is of a strong, light aluminum alloy. All gears are hardened and mounted on spline shafts and all bearings are of the anti-friction type. The drive to the spindle, from the motor mounted on the head, is through V-belts to pick-off speed change gears from which it is transmitted through a hardened and ground worm to a worm wheel directly connected to the spindle. This mechanism is compactly enclosed in the head housing and lubricated by an individual pump. A limit switch, interlocked with the honing cycle to stop the spindle motor at the moment the hone is withdrawn from the bore, is incorporated in the design of the head assembly.

Positive feed control for boring, as well as positive stroke control in hi reciprocative honing feeds, is availab Honing close to a shoulder is limit only by the design of the hone itself; general practice the head can be a justed to stop at the same position each end of a reciprocative honi stroke within 0.0002 in. Jogging of t honing stroke can easily be accomplis ed at any point within a predetermin distance, facilitating removal of tap from cylinder bores. In conjunct with this feature is an adjustable dwe

The head feed is entirely independe of spindle speeds, permitting a lar range of feeds in conjunction with spi dle speeds. Boring feeds vary fr approximately 0.062 to 12 in. per minu controlled through a hand adjusted di mounted on the hydraulic unit. Ra traverse for boring is 30 ft. per minu

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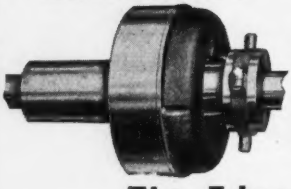

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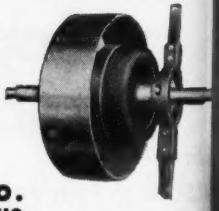

The Edgemont Machine Co.

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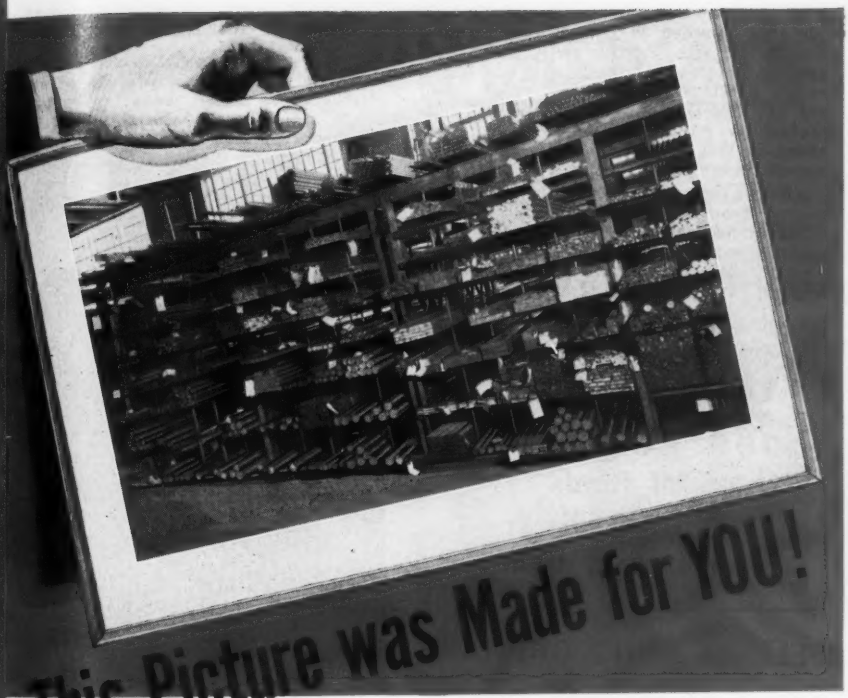

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Dreis & Krump Press Brake

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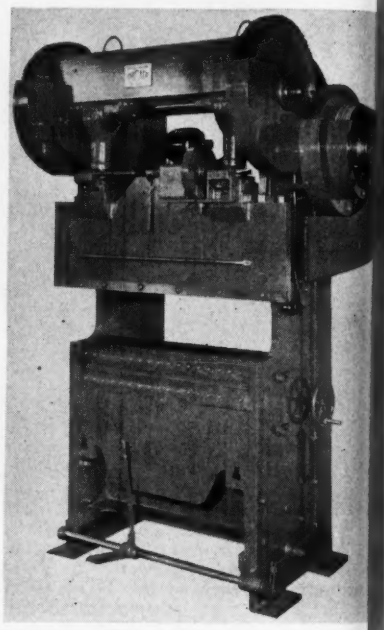

Dreis & Krump Press Brake

cago, Ill. This machine is an adapta of the regular press brake for work merly done on horn presses or on pre with off-center die shoes. On this p all work is done on center of ram p sure. The off-center load is taken the bed, which is widened at the bot and is heavily guided. The bed is justable front to back through a w and worm wheel arrangement. Dies hung on the front of the bed.

The machine illustrated is 70-ton pacity, with 4-in. stroke, 4-in. adj ment, and 12-in. die space above bed. The machine is twin driven, ble back geared, with a friction clu The adjustment of the ram is obta by means of an individual motor. Lu cation is automatic. Specifications

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be changed to suit the customer's individual requirements and heavier presses can be supplied in this construction.

Reed-Prentice Universal Duplicator

The illustrations present a combination hydraulic and electric control duplicator attachment which has been developed by Reed-Prentice Corporation, Worcester, Mass., for use on vertical milling machines for die work and on tool room engine lathes for face and circular form turning. The attachment consists essentially of a motor drive and contact switch arrangement, mounted on casters for portability, and designed so that it can be attached to the control mechanism of a lathe, vertical milling machine, or other similar machine.

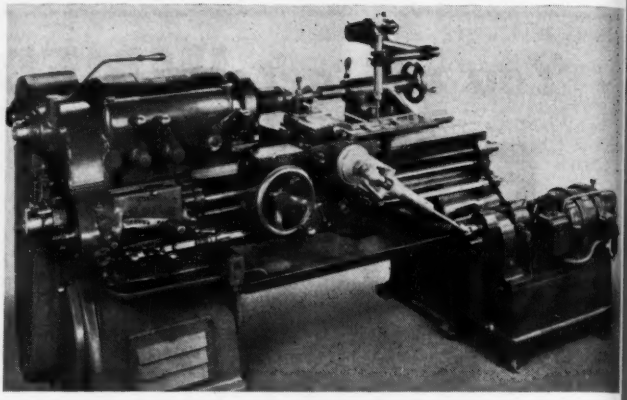
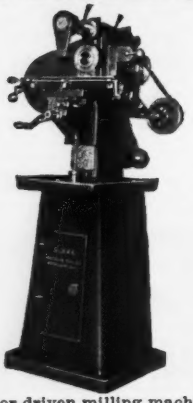


Fig. 1—Reed-Prentice Universal Duplicator Attached to Tool Room Lathe for Duplicate Turning

The attachment can be applied to horizontal boring mills for die work or to planers or shapers for form planing or shaping of molds and dies. The duplicator mechanism is easily attached to a standard machine and can consequently be changed from one machine to another.

In form turning or milling the shape desired is obtained by the use of a pattern and control point through which the movement of the tool is controlled by the electrical mechanism. Figure 1 shows the control point set up on a special arm and the pattern attached to a special bracket which in turn is bolted to the machine carriage. In Fig. 2 the control point is shown held in a special bracket which is clamped to the tailstock spindle.

BURKE Milling Machines



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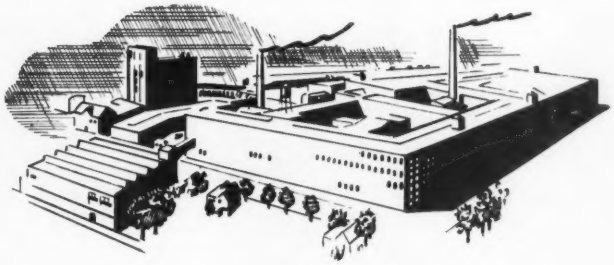

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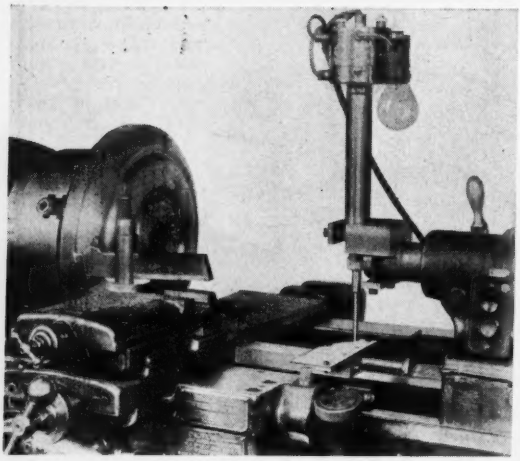

Fig. 2—View Showing Duplicator Control Clamped to Tailstock Spindle for Form Facing

On vertical milling machine work, the attachment can be adapted for three-dimension milling by the use of a small hydraulic motor which is connected to the longitudinal, cross and vertical feeds, using one pump and electric control unit for the three movements.

Rafter Steel Press Brake

The Rafter Steel Press Brake, illustrated herewith, is now being marketed by Bryant Machinery & Engineering Company, 400 W. Madison St., Chicago, Ill., manufacturing rights having been acquired by the Ferracute Machine Company, Bridgeton, N. J. Differing radically in principle from conventional machines, the Rafter Steel Press Brake employs a new patented design wherein the ram is pulled downward into the work, power being applied from below the dies. Reversal of the method of applying power to the ram permits many other valuable improvements in the design.

The Rafter Press Brake consists of only two major members; the ram and the bed. The patented design eliminates many of the heavy parts formerly con-

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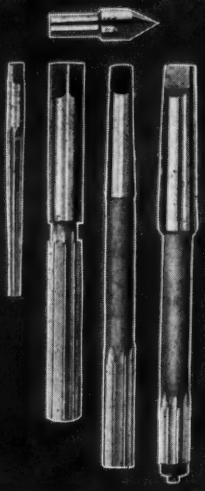

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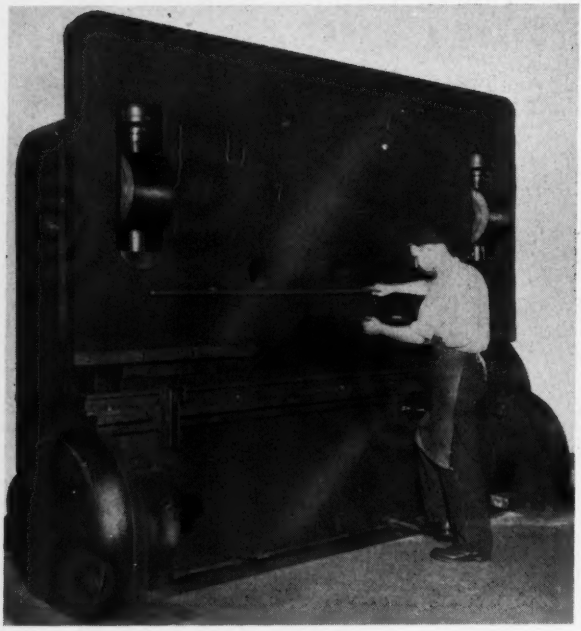


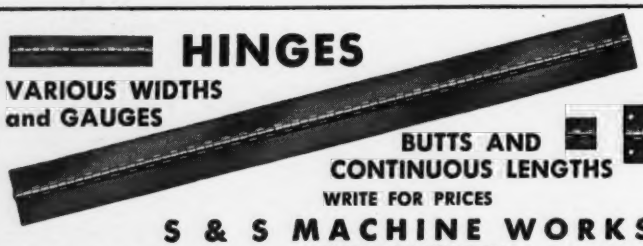
Rafter Steel Press Brake

steel plate. End frames are of rolled steel plate welded to the bed, and serve principally as guides for the ram. The extra long ram guides are of the square locked type. The ram is of an extra heavy single thickness milled steel plate with a heavy horizontal rib welded to the back. Absence of crown member and overhead drive mechanism provide for a ram section of unusual vertical depth. The connecting rod eccentrics are carried in the end of the bed member and the connecting rods extend through the ends of the ram, close to the end frames.

Ram adjustment is by means of a small high torque reversing motor mounted at the back of the ram and connected to the adjusting screw through worm gearing, the motor being controlled through a reversing switch mounted at the front of the machine. Bed frames are full throated. Neither drive mechanism nor other members offer interference to work which must be passed through the machine. All drive mechanism is either attached to or contained in the bed of the machine, the motor being connected to the drive shaft through multiple V-belts and a Rafter patented friction clutch mounted on Timken tapered roller bearings. The usual clutch troubles are eliminated through a patented quick release safety overload de-

sidered necessary, without reducing the strength or the efficiency of the machine. Ram and bed members have been increased in vertical depth, practically eliminating deflection, and overall height is materially reduced, reducing the amount of headroom necessary. The bed member and end frames are welded together and, with the gearing, connecting rods and drive mechanism, comprise a deep, heavy, rugged unit.

The bed is an unusually deep section of extra heavy single thickness rolled



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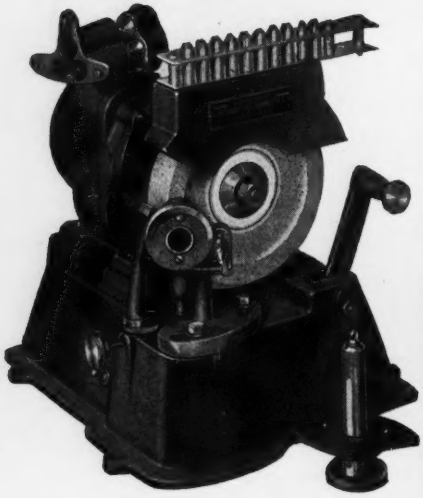

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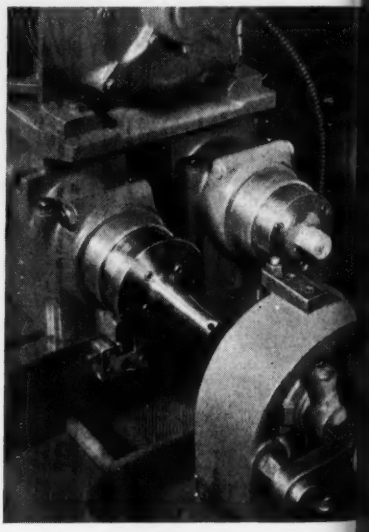
A precision boring spindle which a matically retracts the tool from co with the work on the return stroke been introduced by Ex-Cell-O Corp



Ex-Cell-O Boring Machine Equipped, a with Ex-Cell-O Retracting Spindle

tion, 1206 Oakman Blvd., Detroit, M This spindle is designed for use w extreme surface finish is desired. De ed to the same installation dimensio standard Ex-Cell-O boring spindles, spindle may be interchangeably inst on boring machines already equ with Ex-Cell-O spindles.

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nism. The spindle proper is hollow with a shaft slidable endwise within the hollow spindle. On the end of the spindle is located a tool-carrying quill which is free to move at right angles to the spindle axis in the plane of the cutting tool axis. Within the quill are machined two opposed hollow tapers, one concentric with the axis of the quill while the opposed taper is machined slightly off-center. At the rear or machine end of the spindle a hydraulic cylinder is bolted to the spindle flange, the function of the hydraulic cylinder being to move the central shaft endwise a small amount in the spindle.

When the hydraulic cylinder and piston pull the shaft back to the spindle, a tapered portion on the quill end of the shaft engages the rear taper in the quill, effectively centralizing the quill with the spindle and locking the two in cutting position. When the hydraulic piston pushes the shaft forward through the spindle, the shaft leaves the taper and engages the reverse off-center taper toward the front of the quill, resulting in moving the quill off-center and retracting the tool from the work. At the end of the cutting stroke, reversal of the machine feed also reverses pressure in the hydraulic cylinder to move the cu ting tool out of the way during the re turn stroke.

Royce Double-Drive-Matic Dril ing and Tapping Machine

Designed principally to perform tw important operations at one time—en tirely automatic—the unit shown is no being introduced to the production mar ket by Royce Machine Co., 2418 W Madison St., Chicago, Ill. The most im portant feature of this machine—calle the Double-Drive-Matic — is its abilit to drill and tap at high speeds on sma parts and fittings. According to the ma ufacturer, the Double-Drive-Matic com pletes these two operations on one piec at one time, at a speed of 1,200 per hou It can also perform one operation, al automatic, at 2,500 per hour.

Metal pieces are dropped into one o the 12 "Lock-Jaw" Chucks on a revolv ing turn-table as it passes the operato Automatically, the piece indexes to th first station where it is locked solid for the drill head to lower and dri Instantaneously, the head lowers an drills. Next, the revolving table mov

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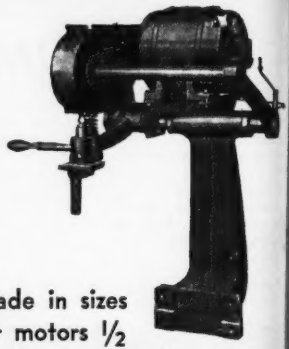

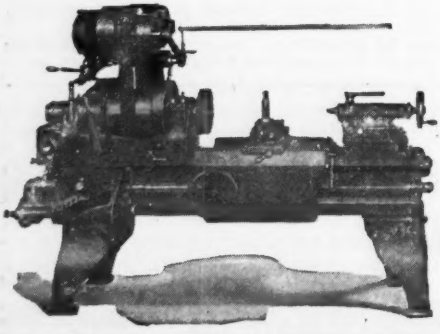

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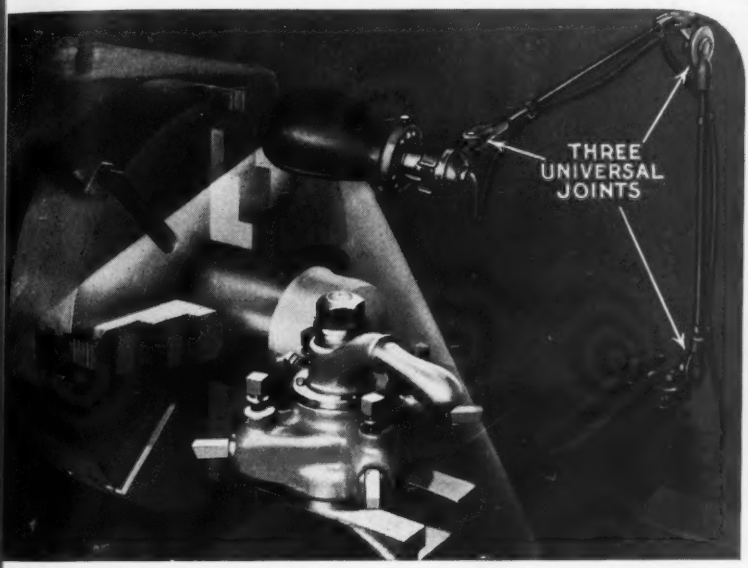

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on to the second station where the hi speed tapping unit lowers and ta Finally, the table moves into the thi station where air pressure ejects t piece.

An exclusive new type of automa locking chuck enables almost every ki and shape of small metal work in sh up to ¾ in. to be inserted without ad tional fixtures or changing of set-u The machine itself is a powerful verti

Royce Double-Drive-Matic Drilling and Tapping Machine

mechanism, the heads of which a driven independently by cam drive Radial dial table, chucks and heads a said to be synchronized to split-secon performance, so that accurate operati are guaranteed. The entire mechanism enclosed in a solidly-built streamlin housing to afford maximum safety the operator and to minimize floor spa

Improved Bridgeport Face Grinder

Changes in the design of the Bridg port Face Grinder — product of T Bridgeport Safety Emery Wheel C Inc., Bridgeport, Conn.—have been ma so that the machine can be operat entirely from one position; the rig hand side at the rear of the machi The illustration shows the Type 75 Fa Grinder. The Type 85 machine is sim lar in construction excepting that it of heavier design.

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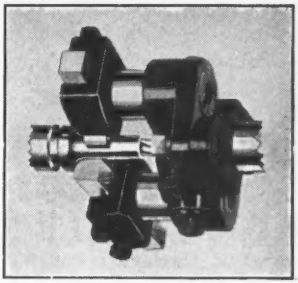

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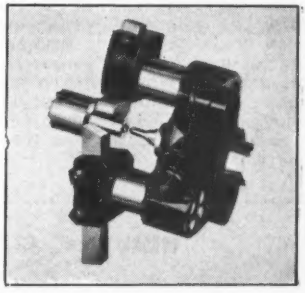

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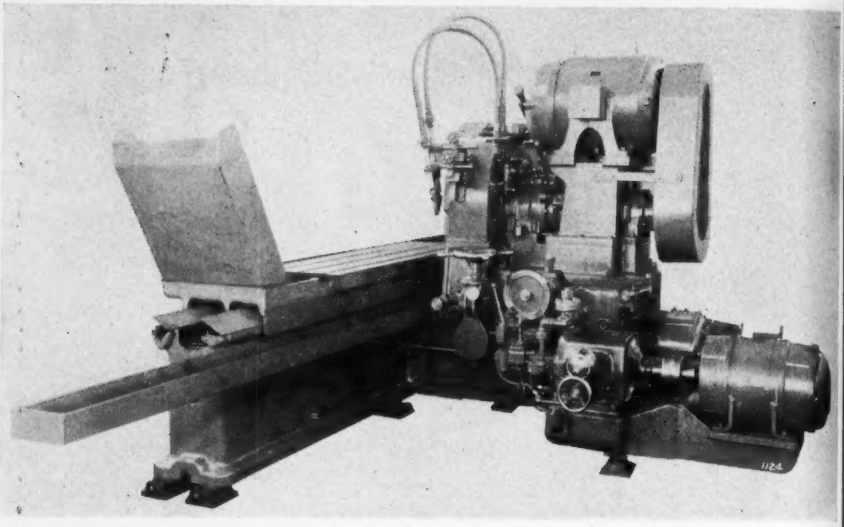

Right Side View of Redesigned Bridgeport Face Grinder Showing All Controls Located at Right Side, Easily Accessible from Operating Position

length of carriage travel and the reversal of carriage travel have been removed from the front of the machine and located on a dial at the operator's position. The speed control change is now taken care of in the improved Oilgear pump which is being applied to this grinder.

The new grinder contains many of the principal points of design which have been characteristic of Bridgeport grinders for a number of years; the segmental grinding wheel with blocks of such shape that a shearing cut is obtained, heavy Timken-equipped spindle, flat and V-ways, and forced feed lubrication of the ways.

Marquette A.C. Arc Welder

Simplicity of operation, smooth power, and low operating temperature are features of the Marquette A.C. Arc Welder now being marketed by Marquette Manufacturing Co., Inc., 411 Johnson St., N. E., Minneapolis, Minn. When ready to weld, the operator simply plugs the ground cable into the tap marked "ground tap" and the electrode cable into the tap labeled for the heat desired, and he is ready to weld. Taper plugs and taps assure perfect contacts and it is said that each of the 15 taps actually delivers the amperage indicated on the ampere meter.

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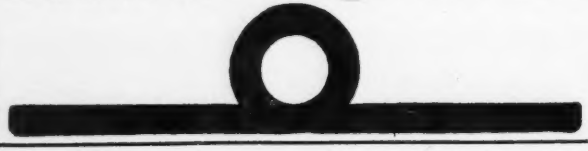

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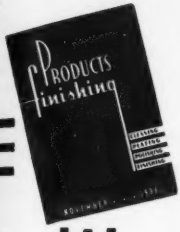

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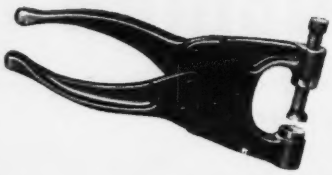

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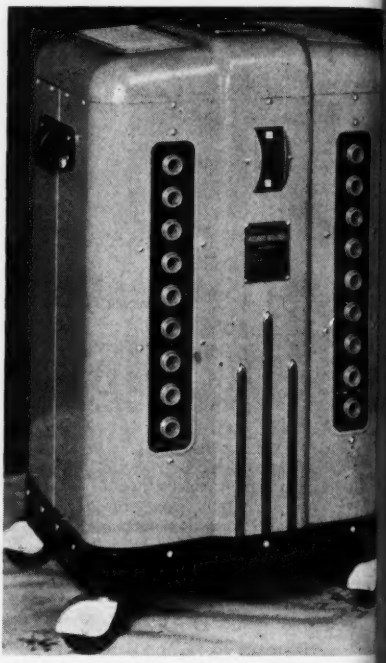
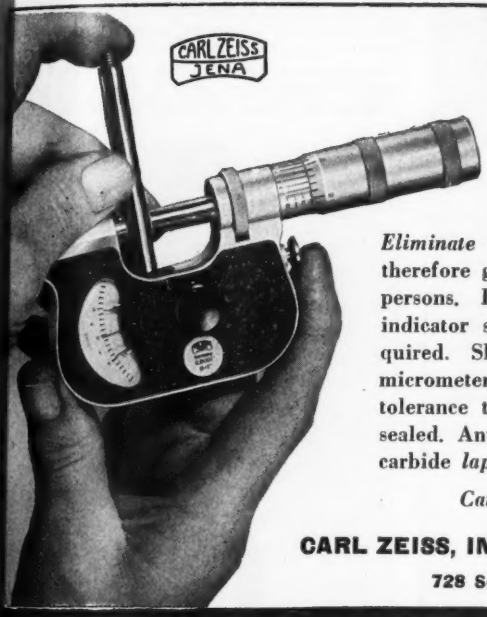


Marquette A.C. Arc Welder

ture, the Marquette Transformer is p vided with facilities for carrying what heat is generated. As the wa air rises through the louvered top, e air enters through the screen on t bottom of the machine. The hooded h composition casters are not affected grease, water or oil, and are said to resistant to bend.

The welder is available in three m els; the Model 300 B, 220 volts, 60 cyc with a range of 20 to 250 amper which is considered as standard for work, tank shops, iron works, garag body shops, continuous production, a so on; Model 200 B, 220 volts, 60 cyc range 20 to 200 amperes for general



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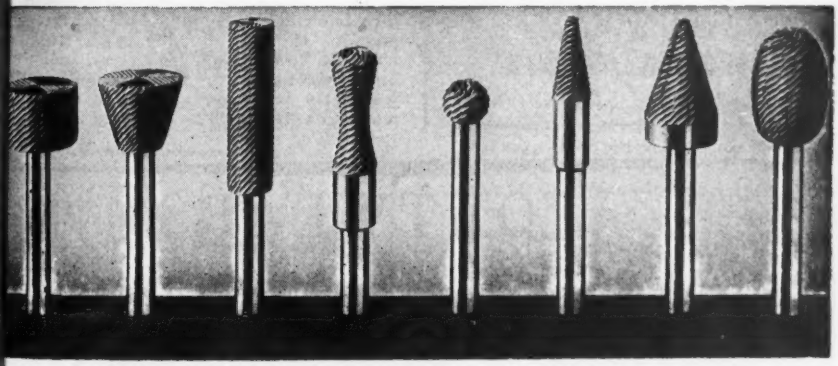

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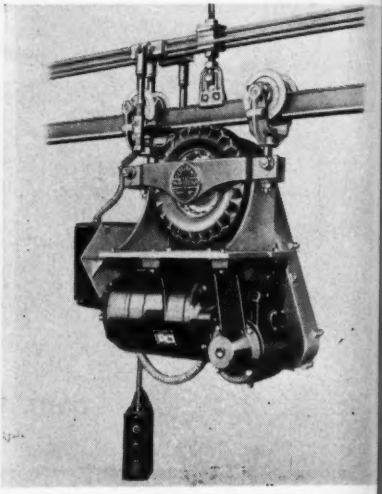

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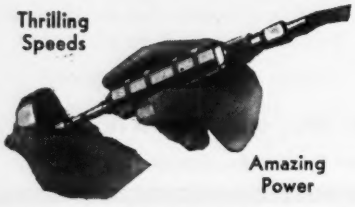

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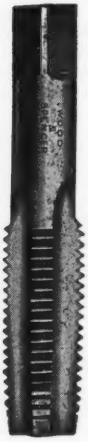

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A line of "Shield-Arc" Welders said to provide the maximum of convenience and accuracy through a self-indicating dual continuous control is announced by The Lincoln Electric Company, Dept. E, Cleveland, Ohio. On this welder both the job selector and current control are calibrated and equipped with dials which indicate the number of amperes for each and every setting for the type of work in process. The welder can vary both the slope of the volt-ampere curve and the amount of welding current independently and positively to suit each job.

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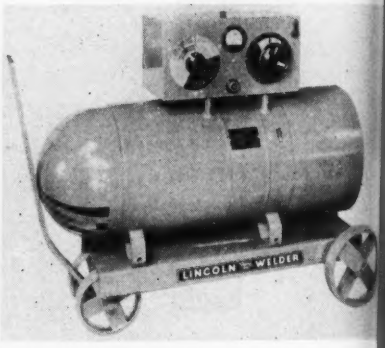

Lincoln "Shield-Arc" Welder with Self-Indicating Control

operation, providing literally thousands of possible combinations of voltage and current, and providing for an exceptionally wide welding range.

A self-protected motor is provided on all A.C. motor driven welders, which is said to permit sustained operation with large size electrodes at high average welding currents without danger of burn-outs. Separate excitation of the welding generator provides the generator with a constant source of excitation independent of conditions at the welding arc, aiding in the maintenance of a steady arc for minimum spatter. Also in the case of engine driven welders, it permits the use of an oversize exciter for the operation of lights and tools.

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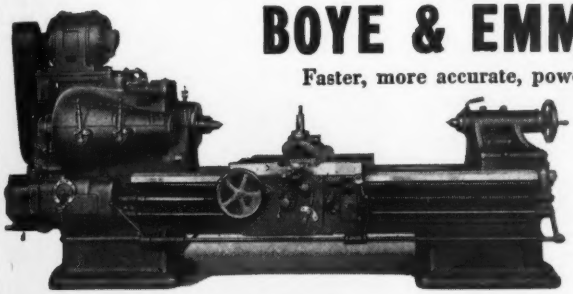

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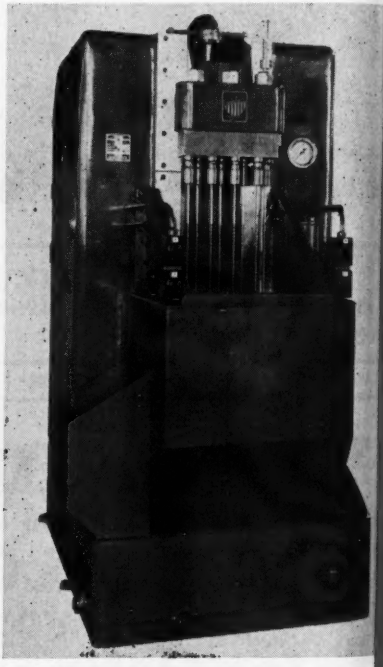
American Type VP Hydraulic Broaching Machine

The Type VP Hydraulic Broaching Machine now being built by American Broach & Machine Company, Ann Arbor, Mich., is said to be an improvement in design and construction over the vertical internal broaching machines which have been manufactured previously by this firm. The machines are of the pull-up type and are built in semi-automatic or full-automatic design as required. Outstanding features are rigidity and smooth, positive cutting action which is reflected in finer hole finishes and longer tool life.

The machine column is integral with the lower base, providing heavy box type construction. This member is well ribbed throughout, providing a substantial flame for the broach pulling cylinder slide, also for the work support and other machine elements. Built into the column are the hardened and ground steel guide ways and caps. The broach pulling cylinder slide is provided with massive square lock type ways cast integral with the cylinder. The pulling lug for adapting the broach connecting heads is also cast integral with the cylinder, ensuring maximum strength. The cylinder is made of close grained nickel iron, lapped to a very fine finish. The piston rod is the fixed member, bolted to the bottom of the machine in a solid manner, as this member receives the operating force of the broaching cylinder. In the interior of this hollow rod the oil feed pipes are securely mounted so that the oil is fed directly to the piston head. Only one packing is required, on the return



American Type VP Hydraulic Broaching Machine

turn or low pressure side of the cylinder, eliminating necessity of having packing under the maximum working pressure.

Sundstrand hydraulic equipment is used, a variable delivery pump of proven design and high efficiency operating the broaching cylinder of the machine. A small auxiliary pump of constant delivery type is provided to operate the broach elevating cylinder. Hydraulic valves which control the machine cycle are solenoid operated. The broach elevating cylinder moves up and down on hardened and ground guide bars which

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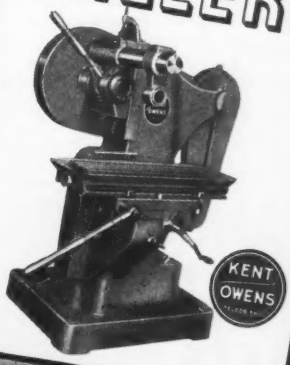

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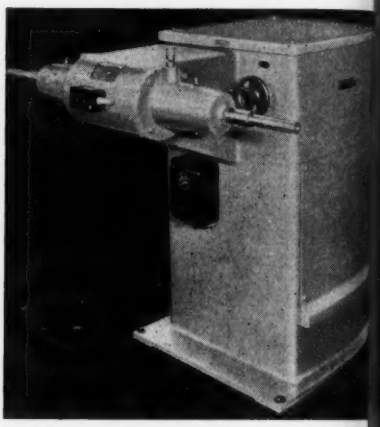
are securely mounted to the machine column. The bracket on the elevating cylinder is adjustable to provide for the various broach lengths within the machine capacity. A coolant pump, concealed within the machine column, is driven by a belt from the main motor. An abundant supply of coolant is piped to the broaches and work.

The machine is driven by motor through V-type belts which can be adjusted for tension from an adjusting screw on the motor bracket. The machine is controlled by means of a push button with emergency stop, an inching button also being provided for convenience in setting up. Limit switches provide for control of the stroke of the broach elevating and pulling cylinders, the limit switches and cams being accessible through the covers on the side of the machine. Lubrication is automatic to the cylinder slide hardened and ground ways, a shot of oil being delivered for distribution to the surfaces through oil grooves at each stroke of the slide.

The maximum broach length is 32 in. and the largest work capacity is 11 in. Cutting speed, maximum, 30 ft. per minute; return speed, 60 ft. per minute. Maximum height, 8 ft. 5 in. Floor sp required, 3 x 5 ft. Weight of machi net, 5,700 lbs. Motor recommended, h.p., 1,800 r.p.m.

"Crown" Variable-Speed Polishing Lathe

Variable and instant speed change the feature of the standard long-o hand polishing lathe now being built

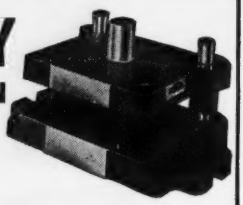


"Crown" Variable-Speed Polishing Lat

Crown Rheostat & Supply Co., 1908 Maypole Ave., Chicago, Ill. The sp change mechanism is intended to eli nate necessity for wrench adjustme

Scratch brushing, buffing, and poli ing can be performed as desired, a the change from one speed to ano requires but a fraction of a minute. merely turning the hand wheel vari

DANLY PRECISION DIE SETS



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YOU'LL SAVE TIME

AND TROUBLE . . . BY SPECIFYING NATIONAL TWIST DRILLS, HOBS, REAMERS . . . MILLING CUTTERS, *Special* TOOLS

NATIONAL TWIST DRILL AND TOOL CO.
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NEW INTEGRAL DRIVE PRECISION BENCH LATHE

(Patented)

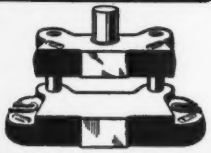
First tool of its class with built-in motor and speed-changing mechanism, entirely eliminating mill-wrighting. Nothing under bench — Nothing overhead. Drive integral with the lathe itself. Marvelous compactness, using little more space than other lathes. Any powerful vibrationless speed at a turn of the hand wheel in front. Belted and wired, ready to run. Priced at only slightly more than other precision lathes with separate, complicated drives. Two splendid sizes. (Colored Bulletin J).

Also Stark Standard Precision Lathes, 6 sizes, ¼" to 1¼" capacity and up to 12" swing; with complete equipment. Stark Spiral Bench Millers, the most accurate of their type.

Stark Tool Co. Est. 1862 Waltham, Mass.

Originators of the American Bench Lathe

BAUMBACH



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50 to 80 thousandths expansion.
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Perfect Alignment.
Will not chatter.
With Left and Right Spirals. It cannot fall in slots or oil grooves. Extension Pilots for Line-up Work.

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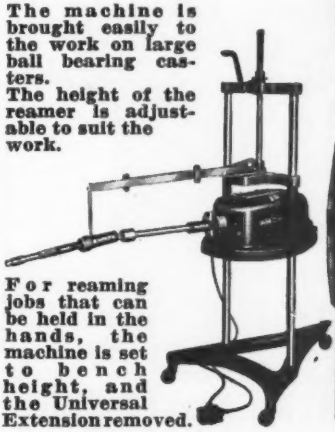
FOR REAMING HEAVY JOBS ANYWHERE IN THE SHOP

The machine is brought easily to the work on large ball bearing casters.
The height of the reamer is adjustable to suit the work.



For reaming jobs that can be held in the hands, the machine is set to bench height, and the Universal Extension removed.

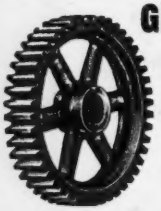
WRITE FOR CIRCULAR

Evans Flexible Reamer Corp.

3656 LINCOLN AVE., CHICAGO, ILL.

speeds ranging from 870 to 3,050 r.p.m. may be obtained.

The lathe is equipped with a 14-in. overhang, allowing greater freedom in the handling of large and bulky pieces. Another feature is its base of welded steel construction, which permits greater control of weight distribution and balance. The spindle, due to its position, is readily accessible and servicing is a simple matter. The standard unit operates from a "V" drive belt at 5 h.p., although other horsepowers can be furnished.



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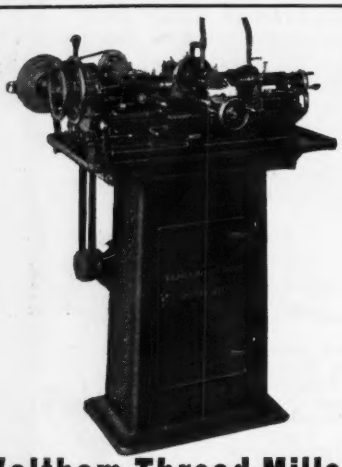


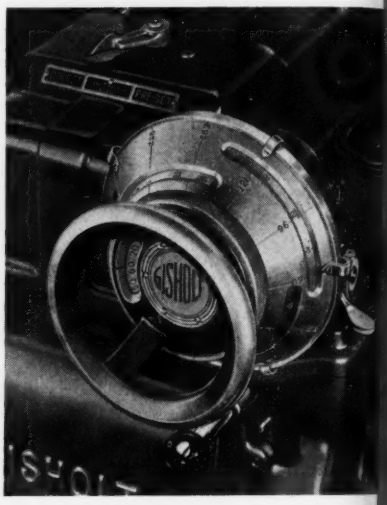
Waltham Thread Miller

Let us explain why this machine is largely used for special taps, single and multiple worms, etc., in tool rooms and factories.

WALTHAM MACHINE WORKS
WALTHAM, MASS.

Gisholt Speed Selector

A Gisholt Speed Selector intended f application to the Gisholt Nos. 3, 4 a 5 Ram-Type Universal Turret Lath has been brought out by Gisholt M chine Company, 1219 E. Washingt



Gisholt Speed Selector

Ave., Madison, Wis. The device is pow operated, the machine automatica making the shifts to the correct spin speeds at the setting of a dial. T Speed Selector is particularly useful keeping machines operating at the m efficient speeds.

The Gisholt Speed Selector provid three types or methods of operation, d pending upon the particular work hand. The first is the "direct" meth where spindle speeds are changed si ply by changing the dial to the desir spindle speed or to the diameter of t cut in process. The dial is convenien located at the front of the headstoc well within the operator's range vision.

The second is the "pre-set" meth where the desired spindle speed for t next cut may be selected and pre-set advance of the actual speed chan while one cut is in progress. The spe change is instantly made by mer touching a trip; the actual shift is d automatically by the machine.

The third is the "high-low" meth

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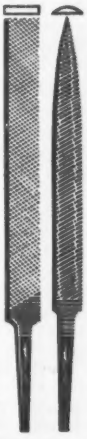

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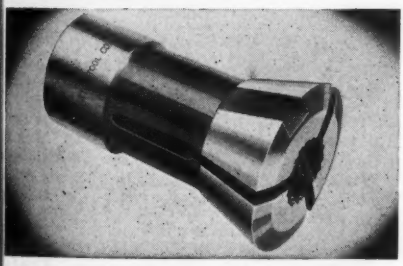
Cooperating to Improve Screw Machine Output



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DIAMOND SERRATIONS clear themselves of dirt and chips and grip tighter under less tension. Single-piece and Master DIAMOND-GRIP Collets for all makes of screw machines listed in complete Sutton Catalog. Send for copy.

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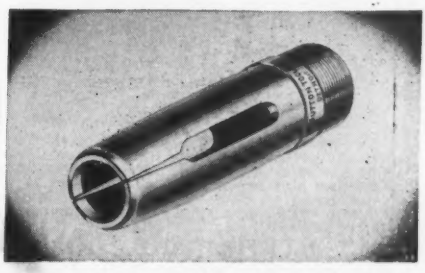
Made from selected alloy steels, expertly heat-treated, ground all over on hardened arbors. Single-piece and Master Feed Fingers for all makes of screw machines listed in complete Sutton Catalog. Send for copy.



SUTTON TOOL CO. 2842 W. Grand Blvd., DETROIT, MICH.

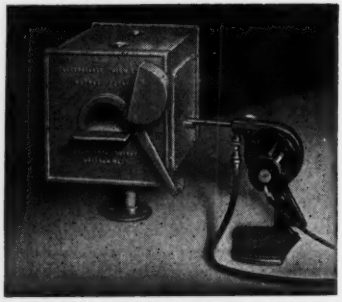
which provides a quick change between high and low speeds and vice versa. By merely pressing the trip, the machine changes from any one of the six high speeds to a corresponding low speed. All spindle speed changes are made without stopping the spindle or releasing the main drive clutch.

The hand wheel controls both the inner and outer dials. The 12 available spindle speeds range from 28 to 730 r.p.m. and are marked on the outer dial. The work diameters from ¼ to 12 in. are marked on the inner dial and may be seen through slots in the outer dial. The cutting speeds, which range from 40 to 600 ft. per minute, may be seen through an opening at the front of the hand wheel. After setting this dial at the proper speed in feet per minute for the task, it is not necessary to change it until change to a different operation is made. The speed selector makes it possible to operate at the most efficient cutting speeds for each diameter of work by merely turning the dial to that diameter; it is not necessary for the operator to depend upon trial and error method to select the proper cutting speed.

"Stark"

"ELECTROBLAST"

High Speed Heat in 20 Minutes



Powerful torch used separately as a very handy portable flame, $40. High Speed Muffle Furnace, no scaling or decarburization, reaches high speed heat in 20 minutes at 7c per hour; quickly saves its cost. Muffle 7"x3½"x2½", $40. Also a larger furnace with built-in torch, muffle 7"x4½"x3½".

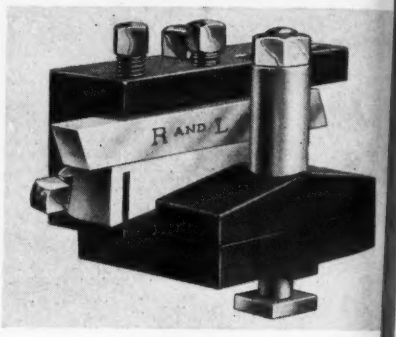
STARK TOOL CO.

Originators of the American Bench Lathe

Est. 1862 Waltham, Mass.

R & L Universal Tool Post

The R & L Universal Tool Post, now being marketed by R & L Tools, 182 Bristol St., Nicetown, Philadelphia, Pa. holds square or flat tools and provides means for adjusting the tool in all directions. The tool post is designed for use on either the front or back cross



R & L Universal Tool Post

slide and for operation with the spindle running either forward or backward. The tool can be set close to the chuck.

The R & L Universal Tool Post is made in three sizes, No. 00, No. 1, and No. 2.

Oilgear Fluid Power Variable Speed Drive

The illustration shows the Type D Precision Speed Control Transmission now being produced by The Oilgear Company, 1323 W. Bruce St., Milwaukee, Wis. This unit is intended to make available the desired speed regardless

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OPTOMATICS and LEVOMATICS maintain a constant level of oil in the and ball bearings.

The DRIP-DROP is a thermal oil dropping oil on the bearing from the top exactly as needed.

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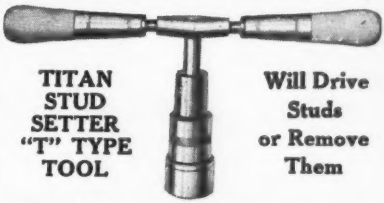
NOW! Set Studs The Roll Grip Way



TITAN STUD SETTER "T" TYPE TOOL

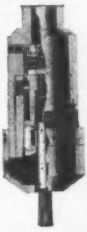
Will Drive Studs or Remove Them

Placed over stud to be set or removed. Slight left or right hand turn effects tight grip on stud. Release is just a matter of reversal accomplished in a split second.

RATCHET TYPE

For corners where interference prevents complete rotation of T Handle tool. Tool slipped over studs is ready to go. Right or left hand drive with ratchet control.

Tool grips and drives studs in or out with first right or left movement, continuing its work until job is completed. The roll grip means a quick trip from stud to stud.



The TITAN drives studs by gripping unthreaded body of stud. It drives studs having as little as ½" of gripping surface. Used as a POWER TOOL it may be driven by electric, air, or machine tool equipment. Write for details.

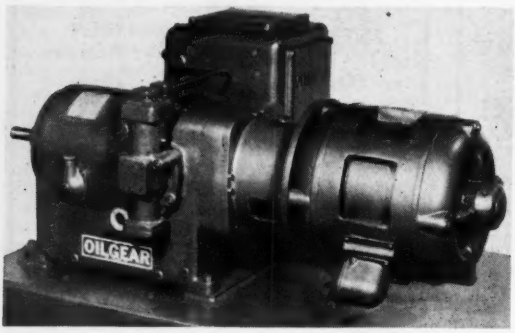
Manufactured under the Kirkland Pat. No. 2069527.

TITAN TOOL COMPANY

FAIRVIEW • PENNSYLVANIA

changes in load, voltage, frequency, speed of drive, oil temperature, or running fits.

The drive comprises a standard Oilgear Fluid Power Transmission with Micro servo-motor stroke control cylinder to adjust the pump stroke so that the exact hydraulic motor speed required will be obtained. Oil is admitted to the cylinder by a pilot valve, actuated by a small differential unit which continuously compares the hydraulic motor speed with time, or with the speed of any desired master unit. Each unit drive may be controlled directly by a small synchronous motor or pendulum to operate at the absolute speed in r.p.m., or by any master unit or roll stand when a precise speed ratio with another unit is required. Pre-set speeds are held within plus or minus ¼ per cent of rated speed when load changes are gradual and are not affected by changes in voltage, frequency, speed of drive to pump end, load, oil temperature, or running fits. One of these units, when driven by an ordinary production motor or a line shaft, will drive its load at any desired speed, either constant, adjustable or continuously varying anywhere between zero and maximum. The output speed is not affected by changes in voltage, or frequency of the power supply, or by temperature.



Oilgear Fluid Power Variable Speed Drive

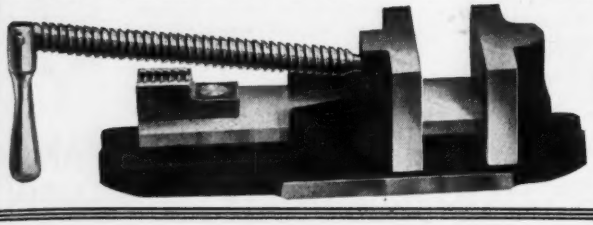
The various units of a continuous rolling mill, paper machine or other process machine may all be driven by a group of Oilgear Precision Drive Units, one unit acting as master to control each of the other units or each unit acting as master to the unit next in sequence in the process. The master may be stopped entirely and started again or turned intermittently by hand, all of the units following in exact pre-set ratio.

Steinel Pivot Burnishing Machine

Designed for use in burnishing shafts and pivots of small pinions to uniform diameter, true roundness, and to smooth the bearing surfaces to a high degree of precision and finish, the Steinel Pivot Burnishing Machine illustrated here with is now being marketed by the George Scherr Company, Inc., 130 Lafayette St., New York, N. Y. The machine is equipped with micrometer adjustment for control of diameter and may be operated by unskilled help.

Among the improvements in the new model are a lever for feeding in the work, controlling a rack and pinion. The burnishing wheel bearing is longer than on the older model, providing greater support, and the foot treadle

SAVE OPERATING TIME ON YOUR DRILL PRESS BY USING THE GREENE



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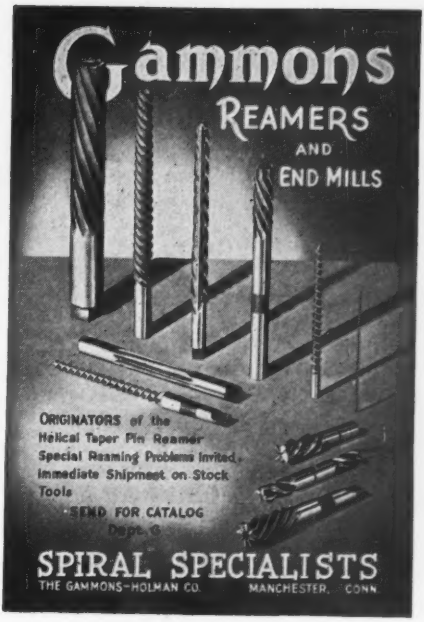

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Special Reaming Problems Invited.
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A booklet designed to enable tap users to obtain maximum efficiency from their taps. Brief and non-technical. Tap and Drill size chart included.

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(Factories at Wrentham and Detroit)
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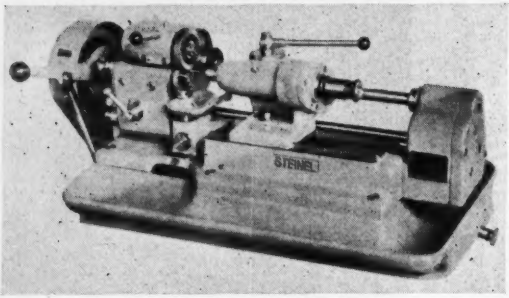

Steinel Pivot Burnishing Machine

now at the head instead of the tail end of the machine, providing greater ease of operation. The belt and pulley are enclosed under a guard, and a reservoir is provided for holding the used oil.

The machine may be used with tungsten carbide wheels, having 20 to 25 times longer life between grinds of the burnishing wheel. The broach rest has a fine height adjustment for various shaft diameters, also adjustment to overcome any taper, if it should occur. The machine will finish bearings, pivots, and similar work produced on au matics to a tolerance of 0.0 in., eliminating necessity holding parts to close to ances on the automatics. I said that in taking off 0.001 to 0.002 in. of material, 600 900 shafts per hour may burnished with an accuracy 0.0004 inches.

Air Kool Die Steels

To meet the need for a steel having characteristics termediate in performan and properties between high carbon high chromium steels the oil hardening, non-deforming ste the Crucible Steel Company of Am ica, 405 Lexington Ave., New Yo N. Y., has developed a steel known Air Kool Die Steel. In volume chan machinability and performance, th steel is said to be intermediate betw the high carbon high chromium ste and the oil hardening, non-deformi die steels. Air Kool is further char terized by an unusually wide safe ha ening range and an exceptionally h toughness.

Add-A-Bin

A neat, compact, efficient and low-c means for keeping track of screws, bol nuts, washers, rivets, staples, pins, g kets, shims, and the innumerable sm parts required in the manufacture, i stallation and servicing of all kinds mechanical equipment is provided Add-A-Bin, introduced by the Nog Products Co., Ann Arbor, Michigan.

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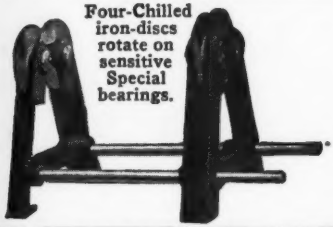
Improved Anderson
Balancing Ways
No Leveling Required
A simple and excellent device for balancing, straightening and trueing.

They are made in the following sizes:

Swing	Greatest Distance Between Standards	Capacity in lbs.
20 in.	20 in.	1,000
40 in.	30 in.	2,000
60 in.	30 in.	2,000
72 in.	66 in.	5,000
96 in.	88 in.	10,000



Four-Chilled iron-discs rotate on sensitive Special bearings.

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Made by **Anderson Bros. Mfg. Co.**
1926 Kishwaukee St. Rockford, Ill.

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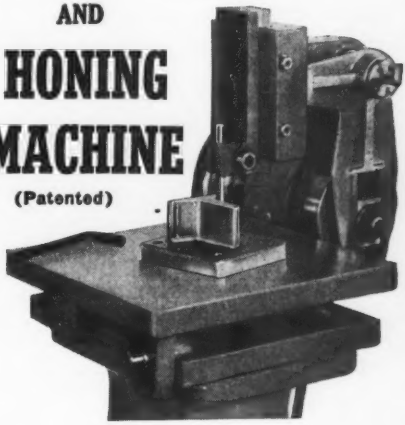
B-K

FILING AND HONING MACHINE
(Patented)



Sturdy, Fast, Accurate

Machine finish your punches. Eliminate the slow, tedious hand method.

Guaranteed to cut your cost. Price and description on request.

BRICKNER-KROPF MACHINE COMPANY, Inc.
MUSKEGON • MICHIGAN

housing may be screwed to a wall, bench or cupboard, or to a panel which may be fashioned into a portable kit. A bin may be opened for removal of a single item and it is so delicately balanced that the weight of its contents, no matter how light, causes it to close automatically

Add-A-Bin Assembly

when the mechanic's hand is removed. If, when open, the bin is lifted slightly, it will lock open. Or it may be lifted higher, pulled out and down. and remain open horizontally for cleaning. It may also be removed entirely from the housing.

When Add-A-Bin assemblies are mounted on either side of a vertical board and provided with a wood base and a handle, they form a parts b which can be carried to the job like tool kit.

Add-A-Bin units are made in t series, which may be assembled shown or in any other desired combin tion or shape. The 3-in. bins are all in. deep, 3 in. high, and 3, 6 9 in. wide. The 4-in. bins are 3 in. deep, 4, 8 or 12 in. wide. T bins are of welded constructio using 26-gauge steel, with gre enamel finish.

Landis Style LBSR Expand ing Chaser Collapsible Tap

Designed for production borin and tapping on work where it necessary to tap from small diam eters, the Landis Collapsible T has been brought out by Land Machine Company, Inc., Wayn boro, Pennsylvania

As shown, a boring and tapp head. are mounted tandem on t tap body to provide for taper b ing the hole and tapping t thread in one pass of the to A pilot bar attached to the b ing head and fitting a bush in the machine spindle suppor the tap and secures proper alig ment with the work. An oil r which directs the flow of coolant the cutters is an integral part of ea tap head.

The design permits using several siz of tap heads on one body. The illustr tion shows an 8-in. head mounted on t tap body and additional heads for 4 a 6-in. diameters. The body is availab in two sizes; the No. 4LBSR Body ca rying 3 to 5-in. heads inclusive and t

For DRILL PRESS • Often used on Miller, Shaper or Planer

Fig. 2. Without Jig Attachments

VISE

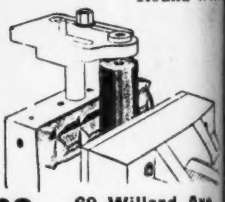
With and Without Jig Attachments

6", 9" and 12" Jaws

All Vises are drilled to take Jig Attachments. Attachments mean much drilling—small Jig cost. *Send for Circulars*

THE GRAHAM MFG. CO., 69 Willard Ave., PROVIDENCE, R. I.

Fig. 3. V-Jaw for Round Work



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• Pioneers in the riveting field. Head rivets from smallest to 5/8" diameter, either by noiseless spinning or vibrating hammer method.—Sizes to meet all needs.—Types include Vertical and Horizontal Multiple Spindles.

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96 Silliman Ave. Bridgeport, Conn.

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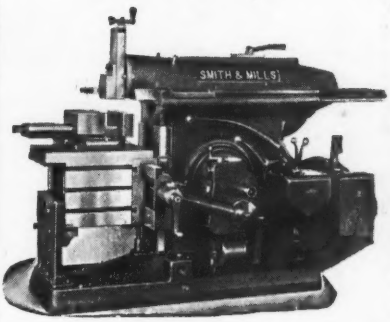

Automatic lubrication—forced feed. Multiple disc clutch and brake. Quick feed changes. Direct reading feed and stroke dials. Power rapid traverse to cross feeds.

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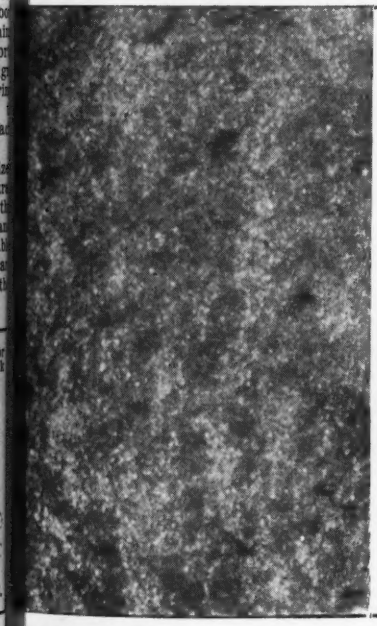

REMARKABLE DIE ALLOY

At left is a cross section of cast-to-shape Strenes metal . . . magnified fifteen diameters and showing the great uniformity of grain found in *every* casting.

Strenes metal dies are 30% to 50% less expensive because most of the usual machine finishing is eliminated. They have unbelievable resistance to wear. They are low in upkeep because they don't gall and "pick up."

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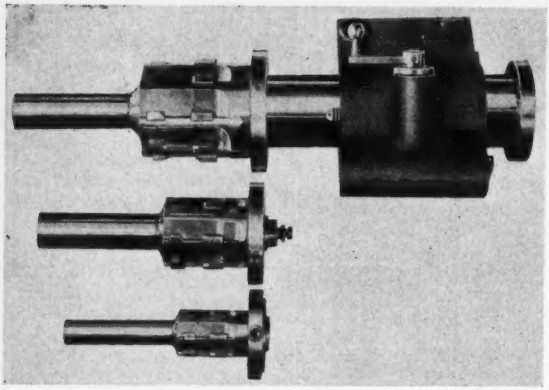

Landis Style LBSR Expanding Chaser Collapsible Tap

No. 6LBSR Body carrying 4 to 12-in. heads inclusive.

When the tap is applied to the machine, two draw rods (not shown) connect the cam collar of the tap to a stationary bracket on the bed of the machine. The draw rods restrict the forward movement of the cam collar as the machine carriage or turret is fed forward, thus imparting expanding action to the through the cam mech nism housed within t cam collar. The tripp ring to contact the face the work can be substitu for the draw rods w the tap is applied to a m chine on which draw r cannot be be used. C tinued forward moveme of the carriage expands tools at the proper rate taper until the tap collap at a pre-determined p for the desired thr length. The tap can b be withdrawn from flange and reset for next operation by a sh movement of the cro handle. The tap can be signed for any desired thr length ranging from 4¼ in. maxim for the 3-in. head to 3⅞ in. maxim for the 12-in. head.

Accurate size is maintained by me of a positive self-locking adjustm Independent adjustment is provided the boring cutters and chasers. The per control cam is arranged to cut ⅜ taper per foot and adjustment is p vided to correct for any slight varia of this taper. Chasers and boring t are mounted in slots milled into the heads, similar to the regular Style Tap. Both chasers and boring tools of high speed steel and the major op ating parts are of especially selec steels, hardened or case carburized precision ground.

Sheffield Universal Interna Measuring Machine

With the Sheffield Universal Inte Measuring Machine, internal diame of any size within the capacity of machine can easily and quickly be m ured. The Model N-2 illustrated h with is the standard model, which measure all internal dimensions f ⅝ to 6 in. against a master or prec block setting. This internal measu machine is a product of Sheffield G Corporation, Dayton, Ohio.

The machine is said to combine oratory accuracy with the sturdi and ease of operation required of a duction line instrument. Two fin

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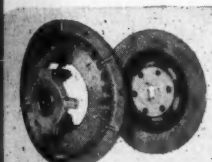
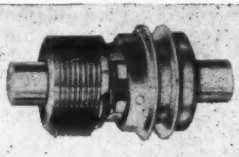
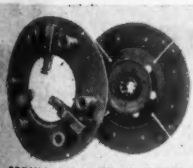
ockford Clutches for Industrial Equipment



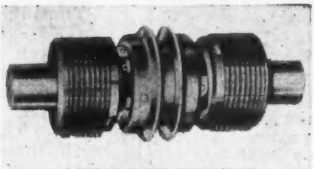
OVER-CENTER CLUTCH



SINGLE TYPE PULLMORE



SPRING-LOADED CLUTCH



DOUBLE TYPE PULLMORE

Pullmore Clutches

Are unexcelled for applications requiring a multiple disc clutch. They are used effectively as main drive clutches carrying all the load; as auxiliary clutches controlling individual units; and in power take-off mechanisms to operate various attachments. Pullmore Clutches are available in single and double types, for operation in oil or dry, in capacities from 1 h.p. to 75 h.p. at 500 r.p.m.

Rockford Clutches

Spring-Loaded and Over-Center, are ideal for use in gasoline and diesel-engine driven equipment. The O-C Clutch remains in or out of engagement until changed by the operator, exclusive anti-friction roller cams make operation extremely easy; the Spring-Loaded Type operates like an automobile clutch. Corresponding sizes are generally interchangeable. Rockford Clutches are available with single or double drive plates, for operation in oil or dry in capacities up to 80 h.p. at 100 r.p.m.

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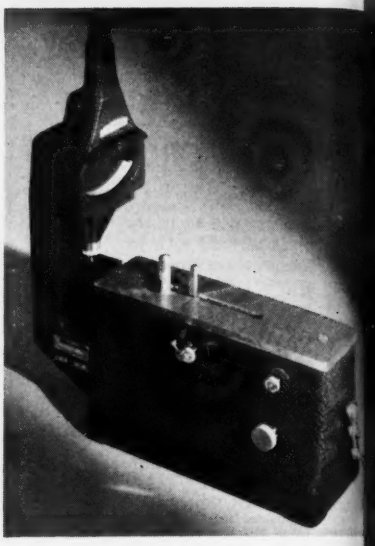
Catherine Street Rockford, Illinois, U. S. A.

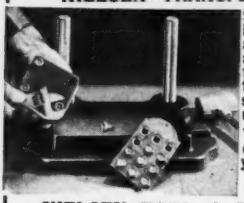
each carrying a measuring point and both adjacent to a vertically traveling work rest plate, are combined so as to permit full exploration and determination of the dimensions of a hole at any point on its internal surface within the 1½-in. depth range of the gage. Consequently, taper as well as diameter is quickly determined throughout the above depth of the hole being checked.

Each of the gaging elements is mounted on vertical reeds; thus no loss of accuracy through friction is possible. The fixed gaging point floats on vertical reeds with a fixed relation to the [illegible] pivot which transfers the motion of [illegible] adjustable gaging point to the vi[illegible] gage. Therefore only a variation in [illegible] distance between the two gaging [illegible] ments will vary the visual gage readi[illegible] In addition there is always gaging p[illegible] sure only on both sides of the hole [illegible] ing checked, irrespective of the op[illegible] tor's touch on the part being measu[illegible]



Model N-2 Sheffield Universal Interna[illegible] Measuring Machine

Accurate Hole Transfer Made Easy With NIELSEN TRANSFER SCREWS



Simply insert in holes, invert, strike sharply and you have centers and drill circles perfectly located. Reduce time and eliminate spoilage of other methods.

7 Sizes U. S. S.—Inexpensive — Last for years.

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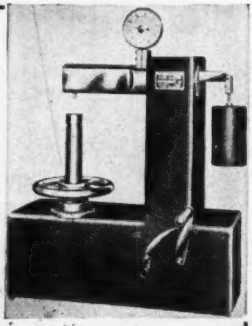
Model "HT"



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Direct Reading hardness numbers in "C," "B," "A," etc., scale. No dash-pot. Speedy, accurate operation.

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S. S. White No. 8 Blowpip[illegible]

The illustration shows the S. S. Wh[illegible] No. 8 Blowpipe, a high intensity gas [illegible] air torch for general purpose solderi[illegible] brazing, and so on, a product of [illegible] S. S. White Dental Mfg. Co., Indust[illegible] Division, 10 E. 40th St., New Yo[illegible] N. Y. The torch is regularly suppl[illegible] with three carburetors: the No. 1 [illegible] coal gas; the No. 2 for natural g[illegible] Propane, Pyrofax, or other petrole[illegible] gases, and the No. 3 for mixtures [illegible] these gases. The carburetor can [illegible] changed in a few seconds with a scr[illegible] driver. Each carburetor is so c[illegible] structed that any increase in the f[illegible] of air at the bench connection automa[illegible] ically increases the flow of gas from [illegible]

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U. S. Drill Heads are made in standard and special sizes. If your job requires special drill heads, our years of specialization in this work will save you money and assure an accurate dependable and swift job. Send your blue prints for estimates.

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- For boring and turning all non-ferrous metals, bakelite, hard rubber, etc. Strong and keen cutting. Guaranteed to perform satisfactorily.

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FIVE to SEVEN MINUTES

For A *Complete* Collet Size Change-Over

WITH

MARTIN MASTER COLLETS

CONSTRUCTION PERMITS QUICK CHANGE OF COLLET SIZES—The Martin Master Collet is so designed that interchangeable pads are removed from the end of the collet. The collet itself **remains in operating position in the machine.** A complete collet size change-over can be made in from five to seven minutes. This time-saving feature becomes especially advantageous when the collet is used on large machines.

NO LOOSENING OF PADS—The pads are integral parts of locking wedges which fit tightly into the end of the collet. They will **positively not become loose.** When it is necessary to change the pads, a few turns of the wedge screws permit quick removal.

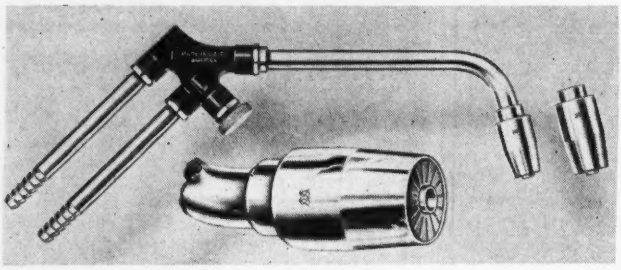
REMARKABLE PRODUCTION SAVINGS—The initial cost of the Martin Master Collet is not high. And with size changes made only by the use of removable pads—which are considerably lower in cost than any complete collet replacement—coupled with the remarkable time-saving features offered by this collet, it is by far the most economical product of its kind ever developed.

Write TODAY for full information.

MODERN COLLET AND MACHINE CO.
401 Salliotte St. Ecorse, Mich.

main line, therefore the proper proportions of gas and air for perfect combustion and maximum temperature are easily maintained when the flame size is changed by adjustment of the air valve at the bench connection and only minor adjustments of the gas finger valve on the blowpipe are required.

Two readily interchangeable types are available, the smaller being suitable for all ordinary soldering and brazing operations. Its flame can be held to a fine needle point or increased to a strong blast. The larger type is for use w large quantities of alloys must ra be melted. The unique design of tips causes two concentric flames t produced; a strong cone-like inner f and a distinct outer flame which ac a pilot light. matter which g gases are used no matter what of flame is requ the flame will clear and defini will not sputte blow out at working air p sure. Moreover, stated that it produce an ex ingly effective ducing flame w is very desirable keeping the m free of oxides w soldering and brazing.



S. S. White No. 8 Blowpipe

The blowpipe is equipped with a p grip handle which is comfortable in By simply loosening a nut, the pipe tip can be turned to produce a flam any direction for heating or solde operations where it is desirable to h the blowpipe rest on the bench, leaving the operator's hands free.

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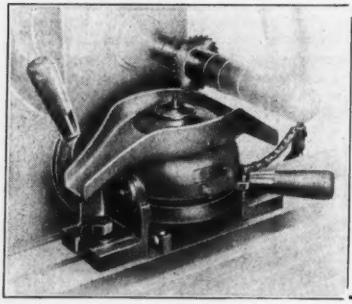
"S & S" Jewelled Hand Tachometer

The George Scherr Company, 130 fayette St., New York, N. Y., brought out a universal hand ta meter especially designed for plants need to measure speeds over a range. This model, known as the "S" Jewelled Hand Tachometer, is to be unique inasmuch as it con



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WITH THE

NEW Dearborn Automatic Chucking and Indexing Fixture

Work held by draw in collets. Collets open an close automatically. Work automatically ejected Indexes without loss of time for milling 1, 2, 4, 6, 8, 12 or 24 sided pieces. Minimum set-u time required. Speeds up production. Positive and accurate in operation.

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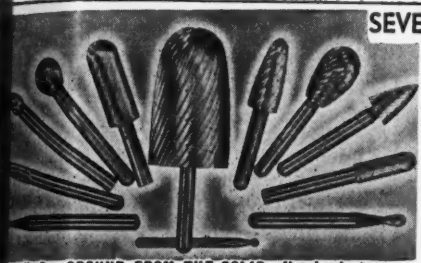

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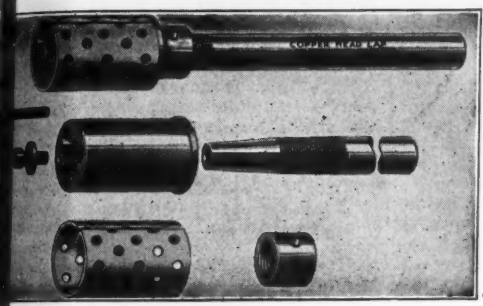

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Many other designs for special applications.

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UNBRAKO SOCKET SCREWS

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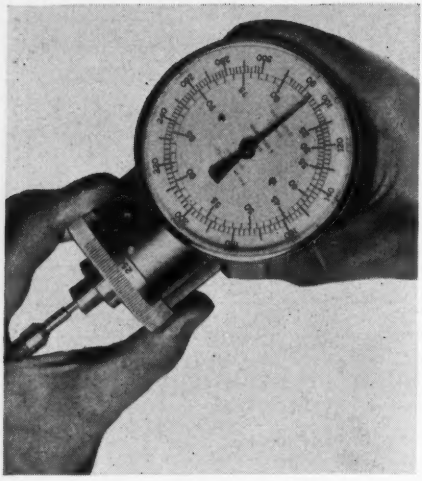

"S & S" Jewelled Hand Tachometer

eight jewels, an improvement that adds to the life of the bearings, reduces repair costs and guarantees accuracy at the high speeds for which the instrument is intended to be used.

The tachometer is manufactured in two models, one measuring from 2[illegible] 40,000 r.p.m. and the other from 2[illegible] 30,000 r.p.m. The pointer makes [illegible] turns around the dial giving reading[illegible] two sets of numerals, one for the [illegible] scale graduations and the other for [illegible] outside. In this way the instrum[illegible] gives twice as much speed cove[illegible] within the one range as previous mo[illegible] which permit only one turn around [illegible] dial. The tachometer operates on [illegible] centrifugal principle. Ranges are [illegible] 30 to 400, 300 to 4,000, 3,000 to 40,00[illegible] one model, and 25 to 300, 250 to [illegible] 2,500 to 30,000 on the second model.

The "S & S" Jewelled Hand Ta[illegible] meter may be used for motors, engi[illegible] shafts and spindles, looms and turbi[illegible] for textile, paper and power plants [illegible] may be applied wherever it is neces[illegible] to check and measure speeds. [illegible] tachometer comes complete in a ve[illegible] lined case, with standard accessories

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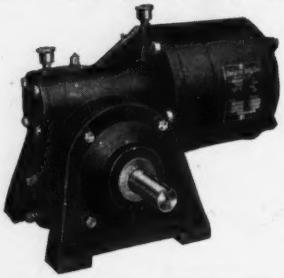
Motorized

SPEED REDUCERS

Sizes from 1/50 to 7½ H.P.



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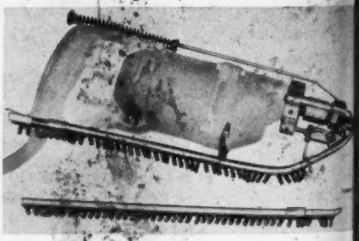
Janette Manufacturing Company

556-558 West Monroe Street

Chicago

Akron Akromatic

The speed and efficiency of port[illegible] power screw drivers can be increa[illegible] considerably by the use of the Ak[illegible] "Akromatic" — a hopper arrange[illegible] applicable to portable screw driven[illegible] designed to hold a quantity of screw[illegible] such manner that they are deliv[illegible] manually, one at a time as needed [illegible] a chuck which holds the screw [illegible] driving. The Akromatic holds, a[illegible] loading, 45 round head 10-32 x ½[illegible] screws. The capacity for other si[illegible] determined by the size of the scr[illegible] When the magazine becomes empt[illegible] can be refilled in a second, the ope[illegible]



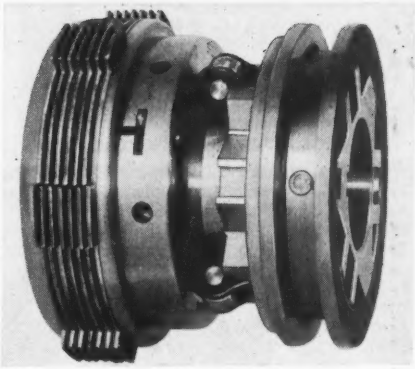
Akron "Akromatic"

being provided with a quantity of [illegible] iliary magazines from which the sc[illegible] are almost instantly transferred to [illegible] screw driver magazine. The aux[illegible]

agazines are loaded automatically from power driven hopper located at any nvenient place in the plant. These mple operations eliminate entirely the anual handling of individual screws. The Akromatic makes it possible to e portable screw drivers in places hich have heretofore been impractical. is stated that there is no chance of e screw driver bit slipping out of the rew slot. No rotating part of the maine can touch the work; an adjustable nit control stops the rotation of the the instant the screw is driven home. ous all screws are driven uniformly, ght or loose, as required. The Akron kromatic can be supplied for any pe or size of screw that can economally be hopper fed, and it can be apted to any type of portable power rew driver whether operated by elecicity, air or flexible shaft. The Akroatic weighs, empty, 1¼ pounds.

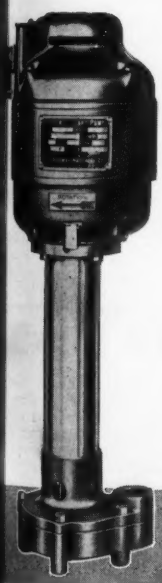
Model MT Multiple Disc Type Clutch

A new model Multiple Disc Type utch, designed for machine tool and her installations where space is limited, has been placed on the market by Twin Disc Clutch Company, Racine, Wis. Known as the Model MT, the clutch has a greatly simplified design, providing easy, smooth engagement and release with less engaging pressure.



Model MT Multiple Disc Type Clutch

The Model MT Clutch is available in nine different sizes, ranging from 3-in. diameter to 8-in., in single or duplex



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● NO PACKING—Gusher Coolant Pumps have no packing nuts to leak, consume power or require adjustment.

NO PRIMING — Priming is automatic and instantaneous. Coolant flows in one-fifth of a second — in a "gusher" or a trickle.

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There's a Gusher Coolant Pump for every cutting need. Write for further information.

THE RUTHMAN MACHINERY CO.
538 E. FRONT STREET • CINCINNATI, O.

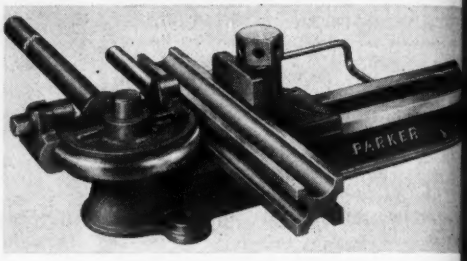
units, to run dry or in oil. Minute adjustments on all sizes can be made from a single point to give maximum capacity from minimum lever pressure.

Parker Hand Tube Benders

Illustrated herewith are two hand tube benders now being marketed by Parker Appliance Company, 17325 Euclid Ave., Cleveland, Ohio. The features of these tools consist in the ease, simplicity, and rapidity with which tubing can be bent, and the practical perfection of the bends. The bends made are neat and accurate and the tubing is neither marred nor deformed. The Parker Hand Tube Bender is intended for hand bending small tubing of from $\frac{1}{8}$ to $\frac{5}{8}$-in. inclusive outside diameters. Other hand bending tools, but of different design, are available for bending tubes as large as $\frac{3}{4}$-in. outside diameter.

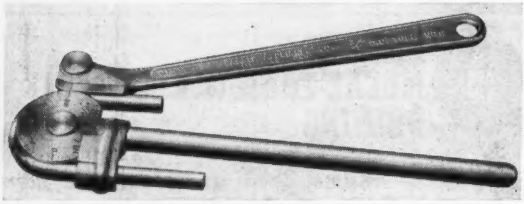
The hand tube bender is designed so that it can be slipped over the tube quickly and without adjustments or preparations. It is not necessary to thread the tube through the be therefore bends may be made on truding ends of tube without distur the tube already installed. The bend made of steel, is light in weight, ru and will withstand the rough han to which a tool of this nature is us subjected.

The Parker Bench Bender is a weight, readily portable, compact b



Parker Bench Tube Bender

bending unit especially designed for duction work. This bender will quarter-hard or full soft, medium h wall tubing to short without the use of mand and without wrinkling flattening. The capacity the bench bender No. 8 ½ to 1¼-in. outside diam tube, inclusive, alth blocks for sizes ⅝ and outside diameter tube ca furnished on order. Stan equipment for the No. benders includes radius slide blocks for four siz tubing from Nos. 8 to 1 to ⅞-in. O.D.) The tool is designe mounting on a bench or on a truc field service.



Parker Hand Tube Bender

. . . for more than 1001 odd jobs

The Hjorth Bench Lathe h the speed, accuracy, handli ease, and dependability that a peals to every operator. That why you'll find the better sho equipping with the Hjort Lathe.

Write today for data and prices.

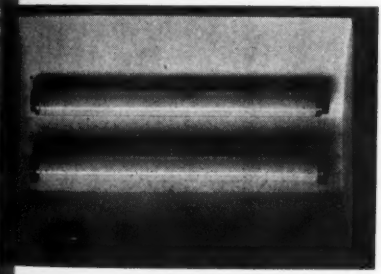
HJORTH LATHE & TOOL CO., 12 BEACON ST., WOBURN, MASS.

Fostoria Fluorescent Type Canopy Localite

he Fostoria Canopy Localite, made The Fostoria Pressed Steel Corpora-, Fostoria, Ohio, is now available in models. All use the same canopy

storia Fluorescent Type Canopy Localite

the same lamp assembly shown in illustrations, and each is equipped h all necessary wiring, sockets, and iliary switches for installation of the

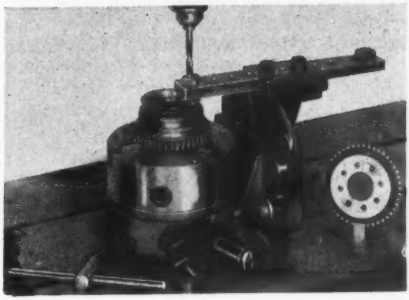


Inside View of Model FA Fostoria Localite Lamp

18-in., 15-watt fluorescent lamps used each Localite.

he canopy used in all models is 13¼ wide, 20 in. long, and 5 in. deep. It tains two magnetic switches and two kets which will accommodate either the two diameters in which these ps are now available. The models as follows: Model FA for overhead allation, Model 74-FA-121 for bench table installation, Model 74-FA-122

HARTFORD "SUPERSPACER"



For Drilling

- Swings work 11" diameter. Holes up to ¾" diameter can be drilled using standard A.S.A. removable bushings. The drilling attachment is quickly secured to base for drilling odd lots of flanges, hubs or other parts where spaced holes on a circle are required.

The Hartford "Superspacer" is adaptable for milling, drilling, slotting or planing. Mask plates prevent errors. For rapid indexing, simply release clamp, withdraw index plunger, revolve turret. Accurate - - rigid.

Write for folder

HARTFORD SPECIAL MACHINERY CO.
HARTFORD • CONN.

for bench or table installation, Model 74-FA-128 for portable floor installation, and Model FA-138 for trolley truck installation.

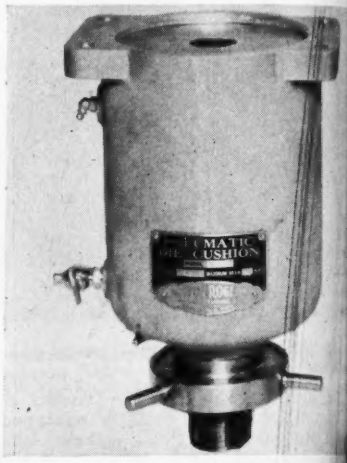
The fluorescent lamp is an electrical discharge device which makes use of the ultra-violet energy from a mercury vapor arc to activate a fluorescent material coating on the inside of the tube surface. The lamp is now being used in those places in industry where special lighting is required for unusually fine work.

Dayton Rogers Model "B" Pneumatic Die Cushion

The Dayton Rogers Manufacturing Company, 2830 South Thirteenth Ave., Minneapolis, Minn., is now announcing its model "B" Universal Pneumatic Die Cushion. The model "B" Universal Pneumatic Die Cushion, with hollow steel stem, is now made in seven sizes having piston diameters from 4 in. to 14 inches.

The added hollow piston stem design allows the scrap slugs to fall through the cushion cylinder, which makes the new design adaptable to both combination blanking, drawing, and pie... as well as particularly adapted to ... per control action on all comp... blanking and piercing dies. No tank... necessary for all standard drawing ... ations. Each cushion is supplied ... plete with a reducing regulator co... valve and pressure gauge.

The cushion cylinders may be mou...



Dayton Rogers Model B Pneumatic ... Cushion

direct to the bottom side of the b... plate or to the bottom of the bed ... of the average inclinable or straight... punch press. The correct height o... strippers on compound blanking di... well as the draw rings on drawing ... is always maintained by the hand ... adjustment feature, thus compens... for bolster plate thickness variation... die sharpening or grinding.

CIRCLE "R"

Trade Mark

Standard or Special Drills

CIRCLE "R" combination center drills are cost-cutting production tools. Special alloy and high speed steel. Write for catalog.

CIRCULAR TOOL CO., Inc.

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AMES JUMB... GAUG...

With 4 ... dial grad... in 1/10... Heavy ... Deep thro...

B. C. A... Compa...

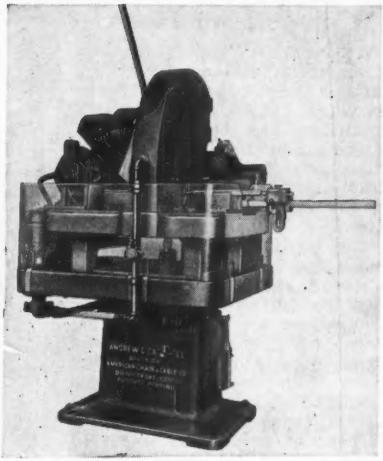
WALTHAM • MASSACHUSE...

Each of the seven sizes of cushions can be provided with two different sizes of hollow steel piston stems.

Campbell No. 213 Abrasive Cutting Machine

The illustration shows the improved Campbell No. 213 Abrasive Cutting Machine which has been placed on the market by Andrew C. Campbell Division, American Chain & Cable Company, Inc., Bridgeport, Conn. The machine is designed to accurately and smoothly cut tubing up to and including 3½ in. or solids up to and including 2 in. By the incorporation of new and improved features, the machine is said to eliminate errors cuts which might result from unequal coolant distribution, damage from off-angle wheels, and lost time spent in measuring.

A fool-proof coolant system distributes coolant to both sides of the abrasive wheel. Coolant box side walls are movable and can be pushed out of line without damaging them. The micrometer stop bar can be set to any length within plus or minus 0.020 in. at first setting without the use of measuring tools.



Campbell No. 213 Abrasive Cutting Machine

Holding pressure clamps, convenient coolant shut-off, reversible work holder liners and safe wheel guards are other features of this machine.

Here's a r-r-really great value in fine lathes, friends . . . .

New Type 'S' SEBASTIAN "Stremeliner"

A modern, precision, quality-built SEBASTIAN LATHE, with completely Timkenized Geared Head at just a few dollars more than the lowest priced machines.

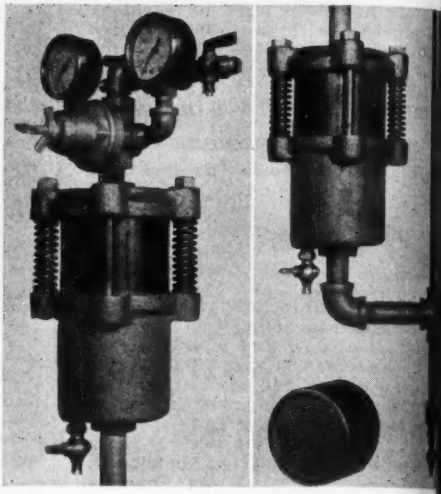
PRICES—Inc. motor and control

12" x 4'.....$ 750.00
16" x 6'.....$1100.00
20" x 8'.....$1600.00
F. O. B. Cincinnati, Ohio

Compare values and you'll buy SEBASTIAN

THE SEBASTIAN LATHE COMPANY
CINCINNATI, O. U.S.A.

Universal Air Filter



Universal Air Filter

Wherever dry, pure air, free of moisture, oil and other impurities is required for process work, the oil, moisture, and impurities can be filtered out of the air by the Universal Air Filter now being marketed by Universal Filter Sales Co., 4221 Forest Park Blvd., St. Louis, Missouri.

The design of the filter is based upon the use of a manufactured stone containing minute pores through which the compressed air is filtered. The stone is highly porous, the 6-in. stone in a 1-in. filter having more than one million pores through which the air must pass. Separation of a large percentage of oil and water is accomplished in the bottom chamber of the filter prior to passage of the air through the fine filter stone. This is done through centrifugal motion. The air flow is vertically upward and the velocity of the air is such that the whirl motion in the bottom chamber causes the larger particles of oil, water other impurities to be thrown out ag the inner rim through which they

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Special Bearings Made to Order.
Any Quantity.
"One Bearing or One Thousand"

Your present bearings duplicated. Send sketch of worn samples, regardless of condition, for quotation.

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Patented

Combination Demagnetizer and Elec
Etching Pencil. Marks symbols
hardest steel. Demagnetizes instan

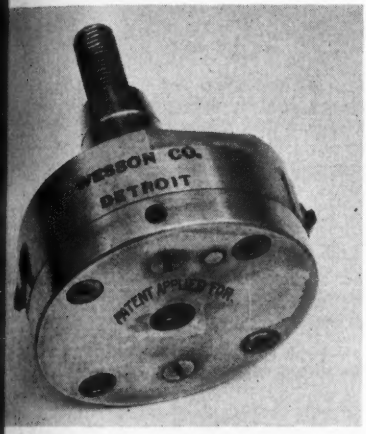
One of our models popular in tool ro
for 15 years.

Luma Electric Equipment C
DEPT. MS TOLEDO, O

t by gravity at the bottom of the amber. The life of the filter stone is definite and, with proper care, should t the life of the filter housing itself. e filter is cast of high grade semi-steel the rings surrounding the filter nes are of steel.

Wesson Automatic Collapsible Boring Head

A fully automatic collapsible boring ad with two or more blades, positive action, is the latest addition to the



esson Automatic Collapsible Boring Head

e of precision and production tools anufactured by the Wesson Company, 0 Mt. Elliott Ave., Detroit, Mich. th the use of solid tungsten carbide l bits the maximum life, together h low tool replacement cost, is obned.

The use of the collapsible boring head finish boring automobile cylinders is d to produce increased accuracy in e, roundness and straightness, higher ality of finish, higher production due increased feed made possible by the ge of the double point cemented carbide tools, and less tool wear, eliminating the stopping or positioning of ndles and indexing part to prevent ring of cylinders on the return oke.

Although especially adapted for cylinder boring, the automatic boring head l produce accurate and well finished es in sleeves or any other hole where cision and finish is required.

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Improved

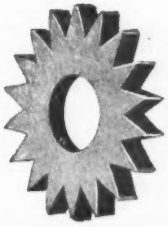
HUNTINGTON DRESSER

WHEN ordering grinding wheel dressers specify Vincent and get the new Improved Huntington Dresser (patent applied for) with bushings that cannot turn and wear out the bearing holes in the handle.

You are entitled to the extra service and efficiency these new Vincent dressers will give.

To be sure— see that you get the grinding wheel dressers with the aluminum finish.

Write for our descriptive catalog sheet.



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"If it's a Huntington dresser or cutter Vincent makes it."

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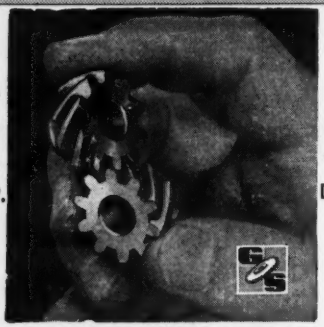

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3 and 4-Way Control Valves for operating single or double acting air, steam, water or oil cylinders. Made in lever, foot, solenoid and motor operated. All pressure up to 3000 lbs. Bulletins on request.

Other Products: Arbor Presses, Flexible Couplings, Steel and Stainless Ball Floats, Steam Traps and Separators, Air Separators, Traps and Vents, Etc.

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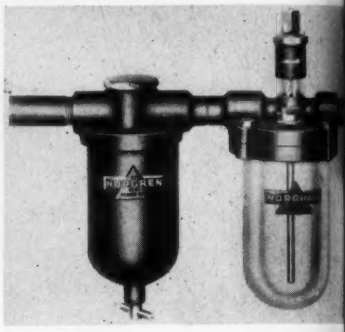
136 Oregon St., Wilkes-Barre, Penna.

Norgren Combination Air Strainer and Sight Feed Automatic Air Line Lubricator

The Norgren Air Strainer and Nor Sight Feed Automatic Air Line Lub tor made by C. A. Norgren Com Inc., 216 Santa Fe Drive, Denver, C have been combined in a device inte to condition air for the efficient op tion of air tools.

The strainer consists of a dou



Norgren Combination Air Strainer and Feed Automatic Air Line Lubricator

screen, a bronze head, and a d steel, tin-dipped bowl. A 200-mesh m metal screen is supported by a 100-m brass screen, increasing the strai area without restricting the air flo lessening the pressure. The screen ment is easily removed for cleaning. strainer removes dirt, scale and o impurities from the air stream and t approximately 92 per cent of the m ture. This model is offered in ¼ an in. sizes.

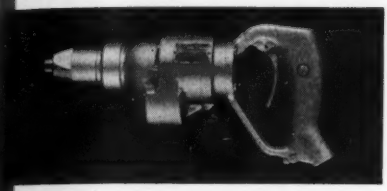
The new lubricator follows in ge the patented design of regular Nor lubricators with the added feature transparent oil reservoir of rei plastic which, it is claimed, will chip, stain, or shatter, which withst the Underwriters' 500-lb. burst test. is suitable for installations in tem atures up to 180 deg. The transp bowl allows checking the reserve su of lubricant at all times.

The oil feed is controlled by a si adjusted valve which is also in sight, revealing the exact amoun lubricant being introduced to the stream. Adjustment is tamper-proo

ller plug in the reservoir top makes filling easy and even with the air line use, new lubricant may be added ithout blow-back or spray. The new bricator is available in ¼, ⅜ and ½- sizes for horizontal lines.

Rotor Triple-Action Impact Clutch

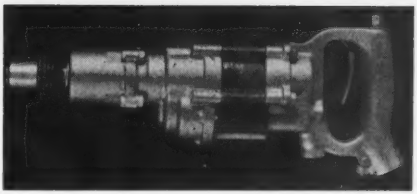
A group of adjustable impact clutches r application to air nut setters and rew drivers ranging in capacity from



Rotor Type E-O M-1084 Nut Setter, ¼-In. Capacity

to ¾ in. is announced by The Rotor ool Company, 17325 Euclid Ave., Cleve- nd, Ohio. In the design of the Rotor clutch, the impact principle is applied to screw driving and nut setting, increasing the turning effort of the clutch to a point greatly in excess of the torque supplied by the motor. First, the torque of the motor drives the nut down, then the triple-action clutch giving three impacts per revolution sets the nut to a pre-determined tension. The operation is rapid and without shock to the operator.

The impact members of the clutch consist of three steel balls which serve as drivers and carry the load, running in three equally spaced raceways in the upper clutch half which contains three interruptions, all of hardened steel. The clutch housing is bronze. An auxiliary,



Rotor Type E-1C M-1094 Nut Setter, ¼-In. Capacity

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ALL 16 OF US STANDARD MAC-ITS ARE STRONG—INVITE US INTO YOUR PLANT TO STOP BROKEN SCREW HEADACHES!

Why chance weak screws when Mac-it makes screws you won't break? Sixteen standard items — socket screws to tool post screws—meet almost any need. See them all in Mac-it's new catalog 3815. Send for free copy TODAY!
FREE Block Buster prover set. Drive a ⅜" Mac-it square head set screw through a steel block! Write for your set today.

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THE ONLY COMPLETE LINE OF HEAT-TREATED, ALLOY SCREWS

JARVIS FLEXIBLE SHAFTING

With many years of experience as manufacturers of flexible shafts and with a great variety of either standard or special flexible shafts to chose from, we are prepared to meet your requirements.

Jarvis flexible shafts may be purchased either cut to length or in mill lengths, for new installations or replacements.

Jarvis flexible shafts are self-contained and can be cut at any point without unraveling.

WRITE FOR CATALOG MST.

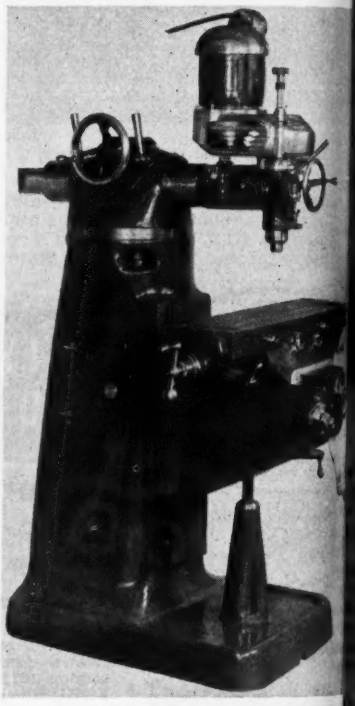
Chas. L. Jarvis Co.

MIDDLETOWN • CONN.

spring-opened clutch keeps the socket stationary when starting or until pressure is applied to the tool. triple-action impact clutch gives form tension to the nuts and screw the assembly line without reactio the operator. Nut setters are ava in sizes up to ¾ in. with a space dle as shown or with side handles.

Bridgeport Turret Milling Machine

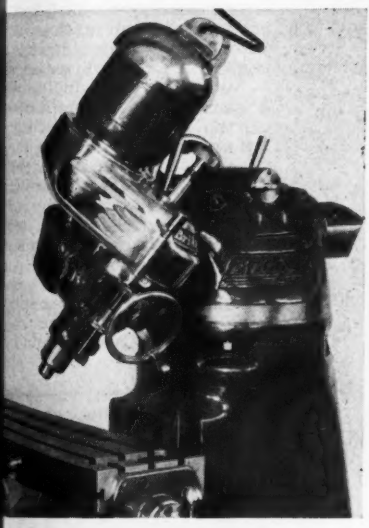
Flexibility, rigidity, and unpara range are outstanding features o turret milling machine now being



Bridgeport Turret Milling Machine

by Bridgeport Machines, Inc., 52 E St., Bridgeport, Conn. The machi especially adapted for tool and f work or metal pattern work, and be found invaluable in the jobbing The machine is equipped with a

meter turret and 5-in. overarm. There also provision for a slotting attachnt on the rear end of the overarm, king it possible to use the machine more than one purpose. Angular setgs in one plane are achieved by turnthe hand wheel by which the keyed erarm is controlled. The table, knee saddle locks are located at the front the machine for convenient operation. The machine is equipped throughout



Bridgeport Master Milling Unit

h anti-friction bearings and the feeds adjustments for large graduated ls, 3½ in. in diameter for easy read- and accuracy.

The machine has a longitudinal feed ge of 20 in. and cross feed of 9 in. vertical feed of the knee is 16 in. ximum distance from spindle to table 7 in. and maximum from spindle to umn is 19½ in. Size of table, 9 x 32 hes.

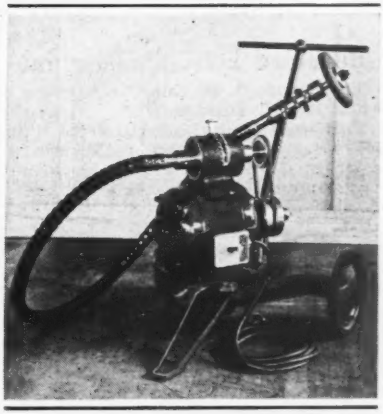
The master milling unit with which machine is equipped operates at ndle speeds of 275, 425, 700, 1,050, 2,100 4,250 r.p.m. Quill travel is 3½ in. A k and worm feed is provided for lling and boring and the unit is equipwith a micrometer depth stop graded in thousandths of an inch. The t is powered by a ½ h.p. heavy duty tor. Weight of milling unit, 113 lbs. ight of machine, 1,500 pounds.

JARVIS

Flexible Shaft MACHINES

A large variety of Jarvis Flexible Shaft Machines, either single or multiple speed, are available for rotary filing, grinding, polishing, buffing, sanding and many other operations. A great number of Jarvis Ground from the Solid Rotary Files and other rotary tools for innumerable operations may be selected from our new catalog MST."

PLEASE WRITE FOR CATALOG "MST" WITHOUT OBLIGATION



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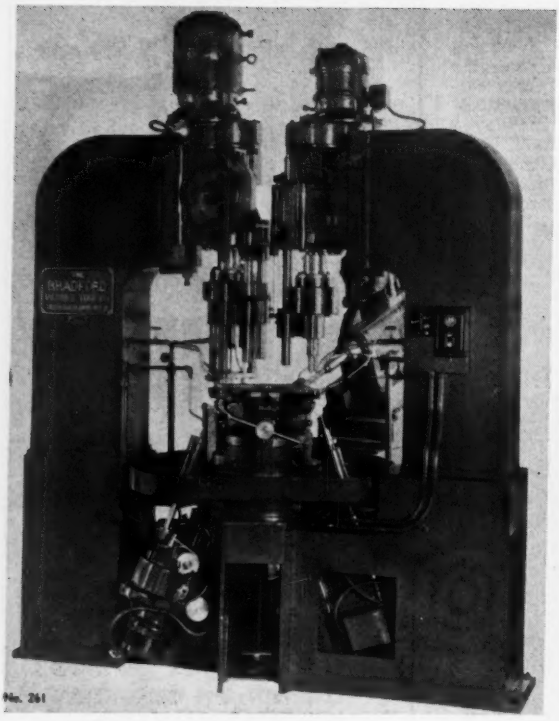

Bradford Six-Unit Machine

Bradford Six-Unit Machine

The Bradford Machine Tool Co., 657 Evans St., Cincinnati, Ohio, has recently furnished the manufacturer of a popular make of automobile the machine shown in the illustration for performing a multiplicity of operations on the oil pump bracket.

The machine incorpo the use of six Bradfor tomatic drilling units a almost entirely of no ized welded steel cons tion, with the excepti the housings of the and the fixtures. A station horizontal inde ble carries the quick-a type fixtures which hol part at each station. I esting features include use of three inverted with sealed spindles come up to the work th the chip and coolant tr an inverted position fo work so that it is held derneath the fixture rather than on top fully enclosed m throughout, and co electrification with p button control, synchr tion of all movement limit switches and re and built-in wiring and trol panel.

The machine perf the following operati Station No. 1, load an load; Station No. 2 two 5/16-in. holes f above and one 23/64 from below; Station 3, counterbore $\frac{0.4370}{0.4385} \times \frac{3}{8}$ in. deep from above and face 1⅞ in. diameter; Station N core drill ⅞-in. diameter 15 deg. from horizontal; Station No. 5, tap ⅝-in.-16 P. holes from above and ⅞-in.-14 P. hole from below.

KELLY

CRANK SHAPERS
HEAVY DUTY

Made in six sizes from 16" to 36" stroke, with motor or single pulley drive. Timken Bearings throughout. Revolving Table. Semi-automatic pressure lubrication. Centralized control. Stroke and feed adjustment during operation. Thoroughly guarded to protect operator and machine. Attractive prices.

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General Engineering & Mfg. Co.
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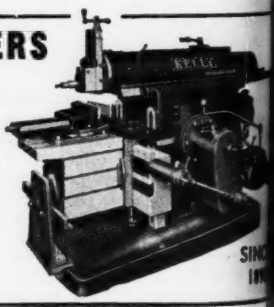


The production obtained, based on an erating efficiency of 85 per cent, is per hour.

Van Dorn Scrugun

highly versatile and compact screw ver for production work, to be known the "Scrugun," has been brought out The Van Dorn Electric Tool Co., wson, Md.. The outstanding structural tures and operating advantages of Van Dorn Holgun have been adapted this unit, giving it exceptional power d stamina and a compact size that nfortably fits the hand for continuous e.

The adjustable clutch can be set for y desired tension and the free spindle es until operating pressure engages clutch jaws. The clutch can quickly adjusted by turning a knurled collar h a pin which extends through a t in the protecting sleeve. The Scru- is said to be an ideal tool for driv- self-tapping screws.

The Scrugun has a screw driving ca- city from No. 4 to No. 12 screws. The ndard no load spindle speed is 750 m. The overall length, including the , is 9½ in. and the net weight is 3¾ lbs. Standard equipment includes a two-pole automatic release trigger switch and locking pin, three-wire cable and plug, one No. 8 bit with finder and sleeve. Available with single or double clutch.

Van Dorn Scrugun

Durant Series H Productimeters

An entire new series of counting machines including stroke and revolution counters in twenty variations to fit any industrial application, is now being

STANDARD
DIAL BORE GAGES

Measures Diametrically through Center of Bore —The CORRECT Way.

Bore measurements are taken diametrically through center of bore. Two centralizing plungers, one on either side of a live gaging member, automatically keep gaging points true with centerline of bore — the *correct way.*

Only five gages required to check diameters from 1" to 12⅞" to an accuracy of .000025". Range extensions furnished with each gage.

Also furnished in Pistol Grip Type, Vertical Type and Vertical 90° Type. Write for catalog.

FOR ACCURATE GAGING—COME TO STANDARD

STANDARD GAGE CO., INC. POUGHKEEPSIE NEW YORK

offered by Durant Manufacturing Company, 1932 N. Buffum St., Milwaukee, Wis. These modern, streamlined counters, to be known as the Series H Pro-

Durant Stroke Counter with Wing Nut Reset

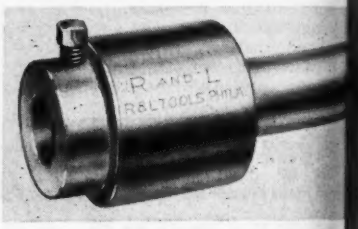
ductimeters, have dust-tight metal covers with dark gray crackle finish.

The counters require no attention or maintenance, as all shafts run on oilless bearings. Cut gears and working parts of the most durable materials, carefully fitted, ensure smooth, accurate operation. Louvered windows and all-metal number wheels with large black figures on a white background make easy reading of the count at some distance from the counter.

Series H Productimeters are available in stroke or rotary models; non-reset, wing nut reset, or tumbler lock reset; operating levers on left or right; shaft extensions on left or right, or both ends; five or six figures, and rotations clockwise or counter clockwise. Unauthorized resetting of the count is prevented where desired, by models carrying tumbler locks permanently fitted to the shaft.

R & L Tap and Die Holder

The R & L Tap and Die Holder manufactured by R & L Tools, 1825 Bristol St., Northtown, Philadelphia, Pa., has been specially designed to incorporate an entirely new releasing mechanism and can readily be changed for left hand threading. The mechanism has been designed to eliminate the use of spring plungers or



R & L Tap and Die Holder

screws; thus there is practically nothing to wear or break or work loose.

The R & L Tap and Die Holder is made in three sizes: No. 00 with ½-in. diameter shank, No. 1 with ¾-in. diameter shank, and No. 2 with 1-in. diameter shank.

CENTERLESS GRINDING

STRAIGHT · CYLINDRICAL
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SCREW MACHINE PRODUCTS, HEAT-TREATED AND GROUND, IF NECESSARY

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SET-UP TIME
Becomes
PRODUCTION TIME

Walker Magnetic Chucks save from 20% to 50% in chucking labor by eliminating slow-acting jigs and fixtures for metal removing operations on lathes, shapers, drills, presses, planers, grinders, etc. Write for Catalog W 3.

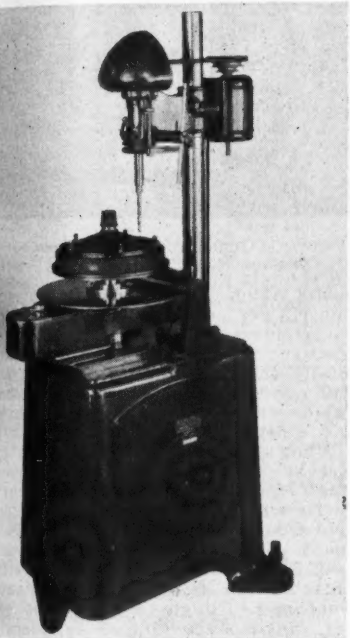
O. S. WALKER CO., Inc.
Worcester • Mass.

No. 618 Bar Pole Face Rectangular Magnetic Chuck
Available in sizes 4x8 to 30x96.

dapters for acorn or button dies can supplied for any one of the three es of die holders. Larger sizes can be de upon order.

"Commerce' Micro-Poise Balancing Machine

The Commerce Pattern Foundry & chine Co., 2211 Grand River Ave., troit, Mich., announces a new model



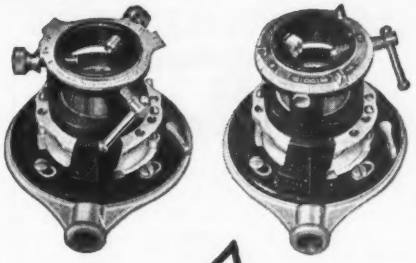
mmerce" Micro-Poise Balancing Machine

their Micro-Poise Balancing Machine, wn in the illustration.

The machine instantly shows the ount and location of the unbalanced tion in such parts as flywheels, fans, tches, brake drums, grinding wheels any narrow-faced rotating part.

The indicated unbalance is corrected turning the work to the heavy side er the drilling unit. A feeding dial the drill is graduated to indicate the ount of metal to be removed by the l to bring the part into balance. The chine is said to be very accurate and t in production.

Mistake-Proof Quick-Setting WORKHOLDERS on these new all-steel malleable alloy RIDGID Threaders



No. 65 RP, ratchet, plate type workholder. Threads 1", 1¼", 1½", 2" pipe with 1 set of dies.

Profit from RIDGID economy in 1939!

No. 65 RC, ratchet, cam type workholder. Threads 4 sizes of pipe with 1 set of dies.

• Enthusiastic approval everywhere from men who know pipe threaders. They like the new durable strength, including the drop forged steel cam plates; the choice of two nearly automatic workholders, cam and plate type, with no bushings. These No. 65s thread 4 sizes of pipe with 1 set of chaser dies. Only 4 dies (instead of 16) and they stay in the tool—can't be lost.

For smooth fast perfect threading, see the new RIDGID 65s.

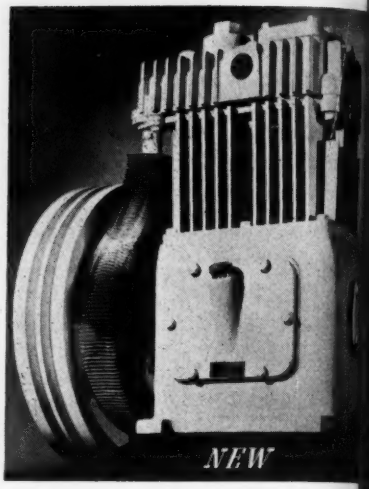
THE RIDGE TOOL CO., ELYRIA, OHIO

MAKERS OF THE FAMOUS RIDGID WRENCH
RIDGID PIPE TOOLS

Quincy Air Compressor

Nine new and improved Quincy air compressors have been announced by the Quincy Compressor Co., Quincy, Ill. These distinctive examples of modern machine design are the result of a conviction on the part of this manufacturer that air compressors deserve to be as good looking as they are efficient.

In addition to their compact, business-like appearance, improved over-all efficiency is also claimed for these new Quincy compressors. This is the result of many important mechanical refine-



Quincy Air Compressor

ments which include simplified const tion, 12 per cent greater radiation on cylinders, a more thorough and positive constant level oiling sy totally enclosed, dust-proof crank and non-breakable, cushioned disch valves that make operation smoo and quieter.

When furnished for automatic and stop operation, these compres come equipped with a loadless star device which automatically withhold load from the motor until it reaches speed. This device also eliminates need for check valves. Sizes range 2.8 to 30.1 cu. ft. per minute piston placement. Single stage—single cy der, single stage—duplex cylinders two-stage models are available in variety of mountings.

Pratt & Whitney 12-In. Model "C" Lathe

Pratt & Whitney Division, N Bement-Pond Company, Hartford, C has announced a new 12-In. Model Lathe, a companion machine to th and 16-in. Model "C" Lathes alread the market. The 12-in. size is avail in two lengths, having center to ce capacities of 30 in. and 54 in. respec ly. Longer lengths are available to der. Although rated as a 12-in. l the swing over the bed is 14½ in.

ALL ALLOY **PORTABLE SHEARS**
FULLY GUARANTEED
Two Sizes
No. 1 cuts up to No. 11 gauge strip or sheet.
No. 2 cuts up to ¼" steel plate.
Special Blades for shearing stainless steel.
BREMIL MFG. CO.
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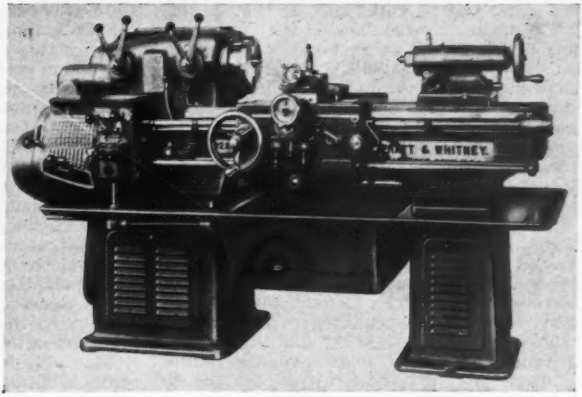
CUT GEARS AND HIGH SPEED ROLLER CHAIN SPROCKETS
F. E. HOLTZ INC.
2738 So. 29th St., Milwaukee, Wis.
WRITE FOR PRICES

the has 18 spindle eeds arranged in ooth geometric pro- ession up to 1,500 r.p.m. Like the larger ma- ines, the constant speed ving motor is mounted a cabinet leg under e headstock, and is ovided with a hinged tform with a screw justment for belt tight- ing. A fully enclosed ree V-belt drive carries wer to the main driv- g pulley on the rear of e headstock. A 3 h.p. nstant speed 1,800 m. ball bearing motor used, either A.C. or C. Electrical controls e in a cabinet leg un- r the tailstock, while e motor push button control is mount- conveniently for the operator's left nd on the quick change gear box. All headstock spindle gears are hard- ed and have ground teeth accurate to 002 in. Except for the pair of helical ars which transmit power from the ive shaft into the headstock, all gears in the spindle train are of the spur type, and are ball bearing mounted. The spindle is mounted on three bearings.



Pratt & Whitney 12-In. Model "C" Lathe

Power from the three-belt drive comes into the machine through a Pullmore double clutch of the multiple disc type and controlled by either of two levers, one at the front of the headstock and

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"To Install an OLIVER of ADRIAN Die Making Machine"

They will reduce your die costs 50 to 60% over hand methods.

They are fast and accurate on all SAWING, FILING AND LAPPING OPERATIONS.

PRICED AS LOW AS $125.00.

Order one today—You will never regret the decision.

OLIVER INSTRUMENT CO.
1430 E. Maumee St. Adrian, Mich.

the other on the right side of the apron.

The rear of the headstock and the bed are built out to form what is called a "column headstock." This ensures solid support to the driving pulley, takes the pull of the driving belt and does away with excessive overhang. Oil is pumped in a continuous rain down over the entire gear train and is led into the various ball bearings, ensuring complete and positive oiling at all times.

The spindle nose is of the new flanged Type D-1 and is known as the "Cam-Lock" Spindle Nose. A camlock device, replacing the usual screw threads, permits spindle chucks to be mounted rigidly, easily and accurately.

Power is taken from the headstock through a set of ratio gears to the quick change gear box which provides for 60 quick changes of feed ranging from 0.0025 to 0.152 in. It also provides for 60 quick thread changes from 1 to 60 threads per inch inclusive. A quadrant and change gear arrangement provides change gears for special threads or for translating gears when needed.

A synchronizing high speed clutch mechanism has been incorporated in the headstock for reversing the lead screw and feed rod drive, thus making it possible to reverse the carriage at hi speeds without stopping. The lever trolling this is on the right hand e the apron and has a vertical move with three positions.

The apron is so designed that front may be removed to permit ful cessibility to the interior mecha without removing the apron from lathe. The apron gears and worm are mounted on ball bearings.

The carriage is mounted on one V one flat way on the bed and is unu ly deep and wide. It is gibbed and back for accurate adjustment. large micrometer dials are graduat give work diameter reductions in sandths of an inch.

The oiling of the carriage, apron cross slide of the 12-in. Model "C" L is accomplished automatically by a pump operated by the action of clutch lever. This is in effect a one system, operating each time the ope starts the spindle.

The 12 x 30-in. lathe weighs app mately 2,700 lbs. net without moto starter, while the 54-in. length we 3,075 lbs. The width of both size 31¾ in., and the overall lengths a and 112 in. respectively.

NEAT STAMPING in NAME PLATES

This machine quickly stamps details and serial numbers into name plates.

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PRECISION BORIN

Easy and Econo cal with Flynn crometer Bor Heads.
For large and s holes. Bar capa 3/16" to 1½" di eter.

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BEX LAYOUT STA

NEW—BETT

Will not chip—Peel—h Dries instantly. Will not t harm tools or material. Co acids. Simple, safe to us

5 oz. Can (Brush in lid)..... .50
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Instantly cleans off BEX
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BECK PRODUCTS COMPA

315 BRIGHTON RD. • PITTSBURG

B. & S. No. 212 Centrifugal Motorpump

A centrifugal motor pump particularly ited for supplying coolants to ma- ine tools, light machinery, and for her installations where a large volume required at a low head and where rt or abrasives may be present in the uid, has been developed by Brown & arpe Mfg. Co., Providence, Rhode Is- nd.

The materials used in the No. 212 Centrifugal Motorpump have been carefully selected to assure long life and dependability. The pump is fitted with a fully enclosed motor and grease-sealed ball bearings. The stainless steel shaft is integral with the motor, providing simplicity and strength. The impeller is aluminum bronze and is of the open type. It is hydraulically balanced and designed to allow abrasives to be discharged without excessive wear within the housing. The impeller case is of cast iron. The discharge pipe clears the motor, which is a con- nience in piping and installation. The mp is powered to handle liquids up to S.S.U at operating temperature. Net ight, 56 pounds.

& S. No. 212 Cen- ifugal Motorpump

Progressive Multiple Punch Hydraulic Unit

Punching and stripping equipment de- ned upon a principle that is based on combination of hydraulic pressure h balanced spring action has been nounced by the Progressive Welder mpany, 737 Piquette Ave., Detroit, ch. Designed for use either indivi- ally or in groups, the punching and ipping units are notable for their plicity of design, construction and ration. There are two types of units;

Murchey

SELF-OPENING DIE HEADS

• The new Murchey Type "T" series of die heads is designed to use tangential chasers giving long chaser life; permanent throat; uniformity of finished work throughout the entire life of chasers; with complete interchangeability of chasers. The helix is in the chaser holding blocks which operate in rugged dovetail slots in the die head. The chaser holding blocks are actuated by cam prongs, insuring positive opening and closing.

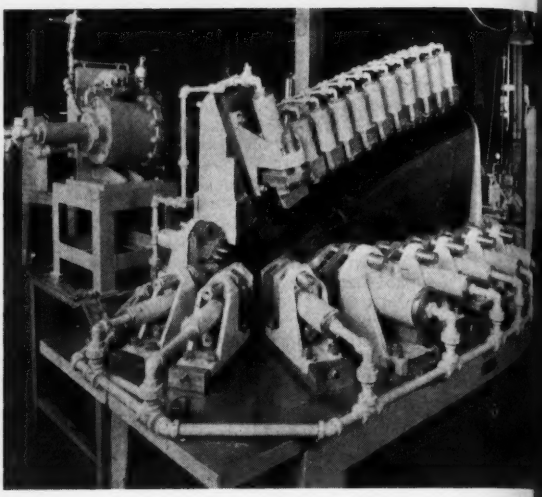
Write for catalog.

MURCHEY MACHINE & TOOL CO.

DETROIT • MICHIGAN

one for single punch operation and another type for a multiple of punches per unit. Up to 2,000 lbs. per square inch, either type may be operated by motor driven pump or by air-hydraulic booster. For higher pressures, the boosters are used.

In the single punch unit, stripping is performed entirely through the action of balanced springs, the operation being completely automatic. The multiple punch unit shown is available for either hydraulic or mechanical stripping. The single punch unit operates as follows: Air at ordinary pressures on the oil in the booster moves both the punch and stripping shoulder up to the work, at which point the resulting back pre stops a switch, admitting air to a the pressure booster cylinder and creating the necessary high pressu drive the punch through the When the pressure at the pr chamber is relieved, the punch is drawn by the action of the stri spring coiled around the punch, is the stronger of the two springs When compression on the stri spring approximates that of the spring, the latter moves the piston away from the work and to the st position.



Thirty-six holes are punched in 150 automobile hood top halv hour with this Progressive fixture, comprising 10 each of th single punch and multiple punch hydraulic punching units mechanical stripping.

Operation of the larger unit is s in principle to that of the smaller

New Nesting Type Tote Pans

Lots of 50
$1.00 each

20" long x 12" wide x 6½" deep.
16 ga., drag holes and handles both ends.

Lots of 100 & 200 less 3%; 300 up less 5%

J. L. LUCAS & SON, INC.
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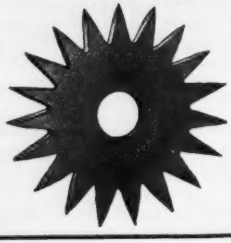

Leaders in quality and design—winners on merit and performance.

Toolholders, Expanding Mandr
Shop Furniture, Emery Wheel Dre
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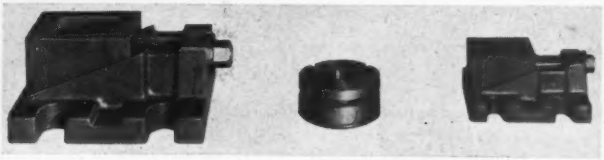
The Western Tool & Manufacturing Co. Spring

cept that two stripping springs are d for the stripping, located in sep- te ground hollow guide pins. When stripping pistons finally bottom in ir cylinders, the continuing retrac- n of the main piston moves the strip- g plate away from the work. The ton, rod, punch retainer and hollow ipping guide pins e integral as far the operation is ncerned, the strip- g guide pins be- carried in large nze bushings, thus suring close align- nt of the punch. hen hydraulic strip- g is employed, a tor driven pump is e usual power source. The illustra- n shows an installation of hydraulic its with mechanical stripping, con- ting of 20 units mounted in a fix- re to punch a total of 36 holes in e-half of an automobile hood top. e use of individual units permits dy re-alignment to suit the job as the sign is changed from time to time. e fixtures are push button controlled, each complete fixture being operated by one man with an average production of 150 pieces per hour.

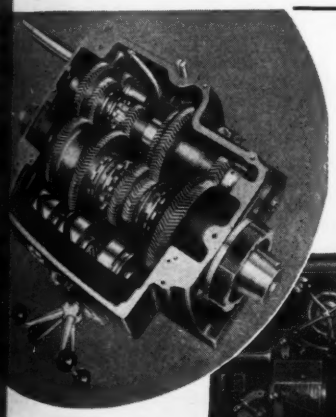
Baker Jacks

Three jacks, designed to aid in aligning and leveling certain types and sizes of machine tools, have been announced by Baker Brothers, Inc., Toledo, Ohio.



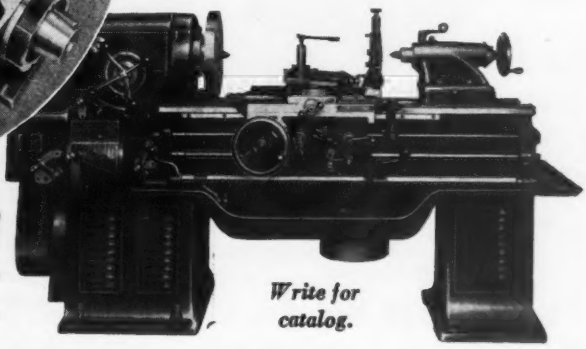
Baker Jacks for Leveling Machine Tools

The No. 41 jack is for use with lathes, milling machines and similar equipment. It is 4 in. in diameter, 2¼ in. in height and has a screw-type adjustment with 1⅝ in. maximum range. The No. 42 is designed for small planers and boring mills. It is 5¾ x 5 x 3 in., and has adjustment range of 2¾ to 3¼ in. by means of angle slide adjustment screw. The



All-Herringbone Transmission
Only in Sidney Lathes

An all-herringbone transmission, composed of 12 continuous-tooth gears, completely eliminates all gear tooth or tool marks from the work. Controlled by Monotrol (1 dial) or Tritol (3 levers). Sizes 14" to 24".



THE SIDNEY
MACHINE TOOL CO.
210 Highland Ave.
Sidney, Ohio

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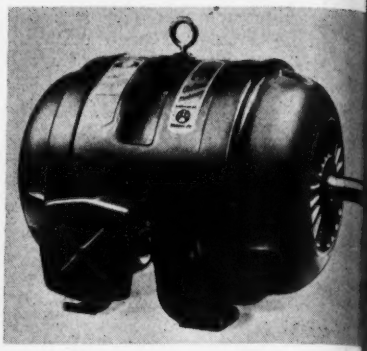
No. 43, for large planers, boring mills, and similar machines, is the same type as the No. 42. It is 9 x 8 x 4¾ in. with angle slide adjustment range of 4¼ to 5 inches.

Fairbanks-Morse Explosion-Proof Motors

A line of explosion-proof ball-bearing motors has been announced by Fairbanks, Morse & Co., 600 S. Michigan Ave., Chicago, Ill. These motors, approved by Underwriters' Laboratories for Class I Group D hazardous locations to ensure against accidental ignition or explosion of vapors or gases which are prevalent in plants producing or employing gasoline, acetone, alcohols, volatile oils or combustible gases.



Fairbanks-Morse Type QZX Explosion-Proof Motor

F-M explosion-proof motors are built in NEMA frames and can easily be applied to pumps, blowers, producer machines, and so on. Double-end ventilation is one of the many exclusive features built into the motors. This feature is said to assure positive cooling from both ends of the motor and eliminate "hot spots," thus adding to the life of the motor windings.

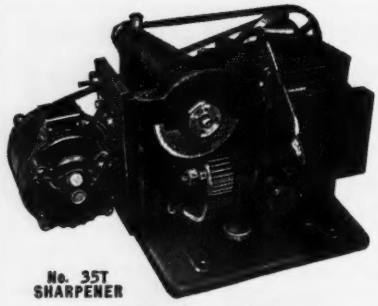
P. & W. Supermicrometer

In the Supermicrometer, Pratt & Whitney Division, Niles-Bement-Pond Company, Hartford, Conn., presents a heavy duty shop instrument which breaches the wide gap between the hand micrometer and the more expen-

PYRO THE SIMPLIFIED OPTICAL PYROMETER

Unique construction enables operator to rapidly determine temperature even on minute spots, fast moving objects or the smallest streams; no correction charts, no accessories, no upkeep. Write for Bulletin No. 80.

THE PYROMETER INSTRUMENT CO.
101-105 Lafayette St., New York



No. 35T SHARPENER

Automatically Sharpens Metal Saws In Gangs

Up to 5½" diameter and up to 1¼" thickness. 100 SAWS of 26 GAUGE CAN BE SHARPENED AT ONE TIME.

The saws are automatically indexed and sharpened within a variation of plus or minus .001 of exact diameter of entire lot.

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The Wardwell Mfg. Co.

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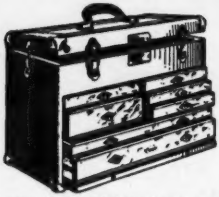


of satisfaction in store for toolmakers and machinists who purchase the first Gerstner Chests.

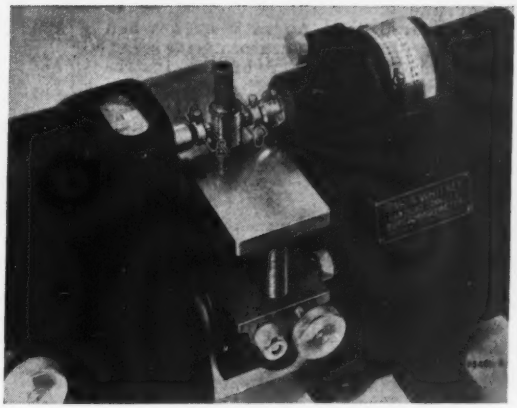
Free Catalog

GERSTNER Tool Chests

1239 COLUMBIA ST., DAYTON, OHIO

easuring machines. The upermicrometer provides a mpact, inexpensive means of easuring directly and accu-tely to ten-thousandths of inch over a range of 9 ches.

The Supermicrometer is a ht, sturdy machine, consist-g essentially of a heavy bar-l, a micrometer headstock ith a 1-in. spindle travel read-g in ten-thousandths, and a essure tailstock which can moved to any position along e barrel. To operate, the an-ls are set by means of stand-d inch gage blocks to pro-ce the desired range. The adstock anvil is set at zero d the tailstock is brought up til the anvil is in contact d the indicator needle is reg-ering on the line. The tailstock is en clamped, the indicator needle re-gned using the dial, and the vernier to zero. The standard inch gage cks are removed, with the channel r, and the tool is ready to make any easurement within the range set. The n. headstock anvil travel provides the final measurement.



P. & W. Supermicrometer

The Pratt & Whitney Pressure Tailstock is an important factor in the accuracy of the Supermicrometer. By setting a knob at the end of the tailstock spindle, pressure of either 1 or 2½ lbs., as required, is instantly available. These definite pressures eliminate the human

SHELDON Back Geared Screw Cutting PRECISION LATHES

sturdy full sized, full weight precision lathes at moderate prices. 10″, 11″ and 12″ swing.

1. Hardened and Ground Spindles
2. ¾″ Collet Capacity
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7. Ball Bearing Spindle Thrust Bearing
8. Oversize Phosphor Bronze Spindle Bearing

No. 1020 BMW
With motor drive attachments, as illustrated, less motor.

$185
F.O.B. CHICAGO
motor extra

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HELDON MACHINE CO., Inc.
55 S. COTTAGE GROVE AVE.
HICAGO, ILL., U. S. A.

Machinery Dealers and Distributors:
There are a few territories still open.
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factor and ensure the same reading to ten-thousandths of an inch even when taken by different operators.

The measuring range of the instrument is up to 9 in., with a maximum opening between the anvils of 10¼ in. The height from the bed to the spindle center is 3 in. Graduations on spindle, 0.050 in. Graduations on dial, 0.001 in. Bench space required, 25 x 7⅛ in. Net weight, 90 pounds.

Brown & Sharpe Rotary Model Permanent Magnet Type Magnetic Chuck

The Permanent Magnet Type Magnetic Chuck now being made by Brown & Sharpe Mfg. Co., Providence, R. I., and illustrated herewith, does not require electric current. All electrical connections, brushes, contact rings, wires, switches and auxiliary generators have been eliminated although it is said that the chuck has strong holding power, adapting it for grinding operations and also for light cuts on lathe work and other machining operations.

The magnets are of a special alloy

Brown & Sharpe Rotary Model Permanent Magnet Type Magnetic Chuck

and are many times stronger than magnets previously available; also, will indefinitely. The chuck can be used wet as well as dry grinding. The chuck is mounted on a machine spindle means of an adapter, the adapter being made special to fit the machine on w

GRAY TURRET HEAD METAL CUTTER OR NIBBLER

Cuts all metals any shape—30 gauge up to 1".

GRAY, Originator of First Practical Metal Cutter or Nibbler.
GRAY Cutters Still Lead.

GRAY MACHINE CO.
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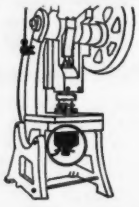

Universal Die Cushi for deep drawi forming die, press pad control, a blanking die strip actions.

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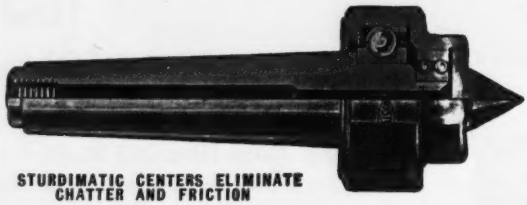
MINNEAPOLIS • MINNES

IT TURNS WITH THE WORK . . .



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8 years continuous use proved its value.

Sturdy radial and thrust b ings insure rigidity and l capacity.

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STURDIMATIC TOOL
5222 THIRD, DETROIT

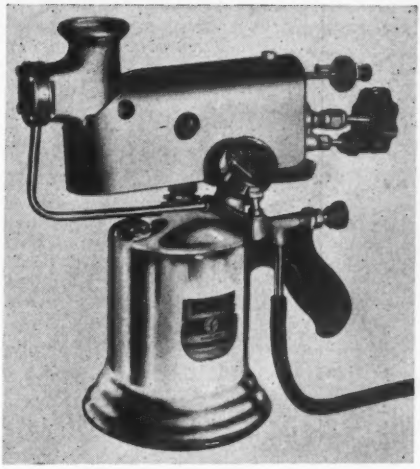
he chuck is to be used. It is said that he chuck will not heat under any conditions and work can be held on it as ong as desired without damage to the ork or chuck. Also, inasmuch as it is ot dependent on current for holding ower, there is no danger of the work eing released due to power failure.

Turner Metal Spray Gun

A metal spray gun of simplified and conomical design, intended for use in he spraying of lead-tin alloys, has been rought out by The Turner Brass Works, Sycamore, Ill. Heat to melt the etal is obtained by the use of a sturdy, rouble-free blow torch, pressure for hich is obtained from an air compresor or air line. However, low air pressure and low volume are required.

A feature of the spray gun consists in hat the metal is fed into the flame anually instead of by mechanism. Any esign of solder or alloy may be used, either wire or bar form, up to ¾-in. iameter; thus the user is not put to he necessity of buying a special size.

Adjustments on the gun permit the omplete control of the air pressure for omizing the metal, complete control



Turner Metal Spray Gun

of the heat applied to the crucible, and complete control of the amount of metal being sprayed. The crucible holds sufficient metal so that it is not necessary to feed metal to it constantly. The metal

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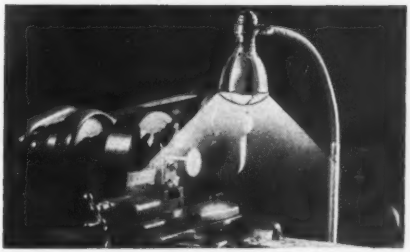

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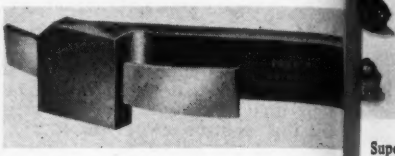
is completely atomized as it is sprayed. A pressure gage registers the amount of air being fed through the nozzle for spraying the metal.

Presto Cut-Off Tool

A cut-off tool the feature of which is an elliptical blade designed to ensure the right cutting angle at all times has been brought out by The Presto Tool Mfg. Co., 120 Newport N., Detroit, Mich. The holder is designed with a shank of the same general size and shape as a tool bit holder so that it will fit a la... tool post and has the same ellipt... shape as the blade so as to ensur... good seat for the tool.

The elliptical blade is ⅞ in. w... across the top and either end can ... used; thus one end can be ground a... smaller cut-off tool or for a thread... tool. Two set screws set into the hol... at the proper angle hold the bl... rigidly.

The holder is supplied in the follow...



Presto Cut-Off Tool

sizes: ⅝ x 1⅜ in. with offset sh... ½ x 1¼ in. with offset shank, or 1... x 4 in. with overall straight shank ... screw machine. The tools are pa... one in a box with one set screw w... and one blade.

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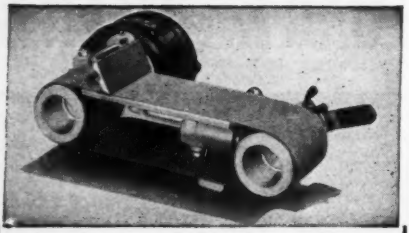

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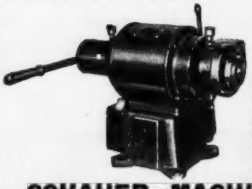

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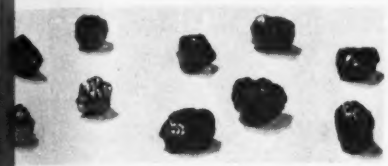
atural diamond. The irregular grain tructure is said to create a stone that annot be cut by the diamond cutter and hich shows an extremely high resisance to breakage.

Diamonds of this construction, identied as the Super Cardimond Wheel ressing Tool, are now being marketed y the Super Tool Company, 21650 Hooer Rd., Detroit, Mich., for use in the



Super Cardimond Wheel Dressing Tool

ressing of grinding wheels. The stones re processed in sizes from approxiately 1½ karats up and come in shapes milar to those of natural stones. There only one grade or quality. Due to the gh resistance of this diamond to wear, ey are said to be economical for use trueing and dressing grinding wheels here the diamond is used in its natral state. The diamond is said to cut eely and to produce an unusually fine, harp surface on the wheel with a minium of wear on the diamond.

U. S." Three-In-One Flexible Rubber Sanding Pad

Announcement is made by The United tates Electrical Tool Co., Cincinnati, hio, of a new three-in-one flexible rubr sanding pad. This is a molded rubr pad which can be used for feather ging, flat sanding or leveling. The one lder serves for all three sizes, and fits

CAMS

All sizes — shapes

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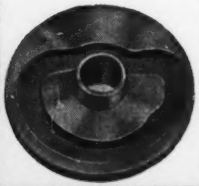
Precision work on special machines, parts, jigs, tools, etc.



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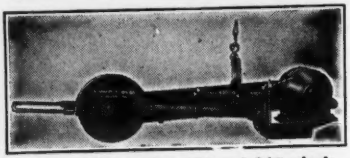

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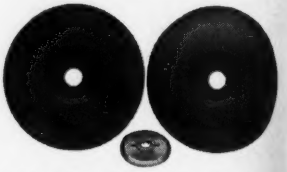
any United States sander. The sand pad is so formed that when the flat face is applied it is ideal for sandi flat surfaces; when it is turned o and the curved surface applied, it equally efficient in sanding curved s faces and feather edging.

The manufacturer claims for this



U. S. 3-in-1 Flexible Rubber Sanding Pad

vention a number of points of superi ity, among them being that this pad a fords perfect balance, long life, gre flexibility, light weight, safety, and th it is non-breakable. The pad holder n fits 5, 7 and 9-in. pads. The pad is solid rubber without metal base whi makes it very flexible and enables t user to get the utmost possible life o of the appliance. There is no danger abrasives injuring the operator, friction is reduced, time is saved because the flexilibity of the pad, and the sand can get into places which formerly m have had to be finished by hand becau of their inaccessibility with a tool.

Bex Lay Out Stain

To simplify the task of preparing t blank surfaces of a tool or die for l out, a lay out stain available in eith purple or black has been brought o by Beck Products Company, 919 Brig ton Rd., N. S., Pittsburgh, Pa. T

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ain is brushed on, a brush attached to he lid of the can being supplied for ven distribution. It is said to be equal- effective on brass, copper, tool steel, ainless steel, tin, cold rolled, alumi- um, cast iron, and so on. The stain

Bex Lay Out Stain

ries rapidly, will not chip or peel off, ontains no acid or harmful ingredients, nd will not tarnish fine tools.

A remover for the stain is available.

Leitz Optical Precision Measuring Instruments

ncluding various sizes and styles of oolmakers' microscopes, large and small rojection apparatus, microscopes for urface inspection, and for metallurgical urposes, are now being marketed by George Scherr Co., 130 Lafayette St., New York, N. Y.

Black & Decker Holgun

The Holgun now being marketed by The Black & Decker Mfg. Co., Towson, Md., is said to be a perfectly proportioned, perfectly balanced tool of compactness and smooth, rugged power. It is, however, a heavy duty production unit made from highest quality materials and designed to provide maximum life with minimum servicing.

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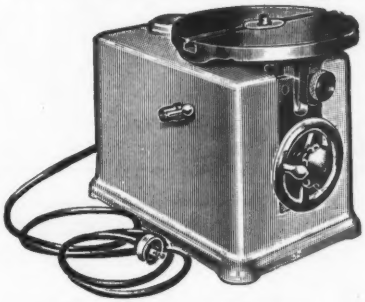

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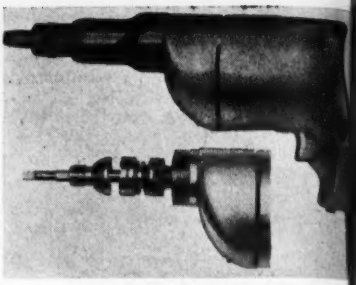

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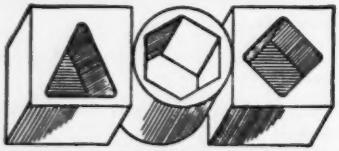

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A forging furnace can be used to produce steam for the steam hammers? See page 50.

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Gears were used in power transmission in the fifteenth century? See page 71.

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A Woodruff key can easily be anchored in a loose seat? See page 108.

Molybdenum is second only to carbon as an effective hardening agent for steel? See page 111.

Compounded diamonds are said to be harder than natural diamonds? See page 194.

Free information can be had on practically any subject connected with the metal industry? See page 200.

Diemaking time and expense can be reduced by using a few cents' worth of matrix metal? See page 64.

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Large inventories of steels are unnecessary? See page 125.

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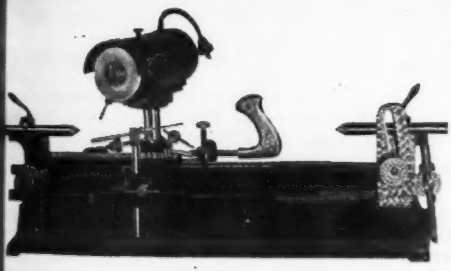

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1. **Hack Saw Blade Manual**
The hows, why and wherefores of hack saw blades and band saws are reviewed in the 32-page manual issued by W. O. Barnes Co., Inc., Detroit, Mich.

2. **Nails, Rivets, Pins, etc.**
An attractive 24-page catalog has been released by John Hassall, Inc., Clay and Oakland Sts., Brooklyn, N. Y. It features special nails, rivets, escutcheon pins, screws and other special headed products.

3. **Universal Reamer Drive**
Evans Flexible Reamer Corp., 3656 Lincoln Ave., Chicago, Ill., has issued bulletin and prices on the universal reamer drive for reaming heavy jobs.

4. **Tool Steel Wall Chart**
A new 20 x 30 tool steel wall chart designed to simplify tool steel selection is available from The Carpenter Steel Co., Reading, Pa.

5. **Universal Turret Lathes**
The J & L Ram Type Universal Turret Lathes are presented in an attractive 32-page catalog by Jones & Lamson Machine Co., Springfield, Vt.

6. **End Mills**
Progressive Tool & Cutter Co., 2345 Wolcott St., Ferndale, Mich., has issued Catalog No. 4, featuring Shear Cut End Mills.

7. **Transfer Screws**
Nielsen Tool & Die Co., 1863 Gardner Ave., Berkley, Mich., has released a folder including price list illustrating and describing Nielsen Transfer Screws.

8. **Punches, Shears, Brakes**
Catalog No. 12 complete with illustrations, descriptions and prices on Whitney Punches, Shears, Angle Iron Machinery and Bending Brakes, has been issued by Whitney Metal Tool Co., 110 Forbes St., Rockford, Ill.

9. **Hardness Testers**
Bulletins illustrating and descri the universal line of hardness T ing Equipment have been rele by Pyro-Electro Instrument Co., W. Chicago Blvd., Detroit, Mich.

10. **Alloy and Special Steels**
Data sheets containing composit application guide, physical prope and heat treating instructions alloy and special steels are avail from Wheelock, Lovejoy & Co., 130 Sidney St., Cambridge, Mass.

11. **Electric Tools**
The complete line of U. S. ele tools is illustrated and descri with specifications in new 72-p Catalog No. 52 which has been leased by United States Electr Tool Co., Cincinnati, Ohio.

12. **Lubricating Oils**
"Spare the time to spare your chinery" is the title of a new fo featuring Stanoils being distrib by Standard Oil Co. (Indiana), S. Michigan Ave., Chicago, Ill.

13. **Magnetic Sine Table**
Omer E. Robbins Co., 635 Mt. ott, Detroit, Mich., has availab new 4-page folder featuring va models of the Magna-Sine for h ing magnetic materials at any quired angle for various machi operations.

14. **Remote Air Operating Systems**
New Bulletin No. 730 gives comp descriptions, specifications and mensions of Logan Master Co Valves and bleeders, as well as merous typical operating circ Logansport Machine, Incorpora Logansport, Ind.

15. **Milling Machines**
A new factual booklet featuring cinnati High-Speed Dial Type ing Machines has been released The Cincinnati Milling Machine Cincinnati, Ohio.

Flexible Shafting
Stow Mfg. Co., Inc., 1 Shear St., Binghamton, N. Y., has announced a new catalog No. 38 covering the line of Stow Flexible Shaft equipment.

Tote Pans and Stackracks
Illustrated folders and price lists on Stackbin Tote Pans and Stackracks have been issued by Stackbin Corp., 53 Troy St., Providence, R. I.

Handbook on Tapping
A New Handbook on Tapping, containing much valuable information for tap users, has been issued by Winter Bros. Co., Wrentham, Mass.

Automatic Dies and Taps
Catalog D-38, just off the press, describes and illustrates in its 64 pages 17 styles (95 sizes) of Dies and Taps manufactured by National Acme Co., 170 E. 131st St., Cleveland, Ohio.

Flexible Shaft Equipment
A new folder illustrating and describing the new Walker-Turner Flexible Shaft Line is available from Walker-Turner Co., Inc., 7118 Berckman St., Plainfield, N. J.

Comparators
Pedestal and Bench Type Comparators are illustrated and described in a catalog available from Jones & Lamson Machine Co., Springfield, Vt.

22. **Shop Tools**
More than 3,000 precision tools and dial indicators are shown and described in Catalog No. 26MD. The L. S. Starrett Co., Athol, Mass.

23. **Small Tools**
Brown & Sharpe Mfg. Co., Providence, R. I., has just announced the new small tools Catalog No. 33. Listings of small tools, cutters, screw machine tools, arbors, collets and miscellaneous shop equipment are included.

24. **Cut-Off and Miter Machines**
A new 4-page folder which describes and illustrates Tannewitz Metal Cut-Off and Miter Machines is available from The Tannewitz Works, Grand Rapids, Mich.

25. **Surface Grinder**
Blanchard Machine Co., 64 State St., Cambridge, Mass., has issued a 75-page work book showing how to handle surface grinding jobs most efficiently.

26. **Hydraulic Lifting Equipment**
Rotary Lift Co., Memphis, Tenn., has issued an attractive catalog 33-Y, which illustrates and describes Levelators (ramp eliminators) and Tabelators (elevating work tables).

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Thor High Frequency Portable Electric Tool Catalog. The Independent Pneumatic Tool Company, 600 W. Jackson Blvd., Chicago, Ill., has issued a catalog No. 60 on its line of Thor High Frequency Electric Tools. This new book gives complete specifications on the entire Thor line of high frequency electric drills, screw drivers, net setters, reamers, grinders, sanders, polishers and electric tool accessories.

A wide variety of attachments for use with Thor screw drivers and nut setters are also shown. These include angle attachments for operation in hard-to-reach places, attachments for driving screws and nuts to predetermined tension, and so on.

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Burt Walter

The RotoMill—a production machine in which milling cutters are employed to perform the task usually allotted to the standard single end cutting tool commonly used on the lathe—is presented in an 18-page loose leaf bulletin issued by National Broach and Machine Company, Shoemaker & St. Jean St., Detroit, Mich. The bulletin presents, in color, a number of modern production opera that are now being performed by machine and gives full details rega the parts, material, work dimen types of cutters used, amount of removed, speed, and production. C section drawings show the locati the cutters in regard to the work. free upon request.